United States
Department of
Agriculture

Forest Service

Pacific
Southwest Region

R5-MB-106
February 2006

Draft Environmental Impact Statement

Slapjack Project

Feather River Ranger District, Plumas National Forest

Butte and Yuba Counties, California

Logging in Clipper Mills, 1890s

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SLAPJACK PROJECT

Draft
Environmental Impact Statement

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Abstract: The United States Department of Agriculture, U.S. Forest Service, Plumas National Forest, Feather River Ranger District proposes to protect rural communities from fire hazards by constructing Defensible Fuel Profile Zone s (DFPZs); implementing group selection harvest methods to create a fire-resilient healthy forest ecosystem; implementing individual tree selection harvests to restore stand densities more characteristic of past natural fire regimes; performing associated road system improvement work; and carrying out a range of aquatic, native plant, and wildlife habitat improvement activities on approximately 5,000 acres of forested federal land near Challenge, Forbestown, Feather Falls, and Clipper Mills, California. This *Slapjack Project Draft Environmental Impact Statement* documents the analysis of the following seven alternatives:

- **Alternative A** proposes no action.
- **Alternative B** is the original action proposed to the public for scoping in September 2005. It has been slightly modified in response to more detailed analysis. Alternative B proposes fuel treatments that include construction of Defensible Fuel Profile Zone s (DFPZ), group selection harvest, individual tree selection harvest, road system improvements, native plant and wildlife habitat improvements, meadow restoration, use of herbicides and other control methods to eradicate noxious weeds, and use of herbicides for preventive maintenance of DFPZs.
- **Alternative C** is the same as alterative B but without the use of herbicides for DFPZ preventive maintenance or for noxious weed control.
- **Alternative D** is the same as alternative B but without the use of herbicides for DFPZ preventive maintenance. Alternative D is the Forest Service preferred alternative.
- **Alternative E** is the same as alternative B but without the use of herbicides for noxious weed control.

- **Alternative F** is the same as alternative B but without group selection or individual tree selection units in watersheds where there is an increased potential for watershed effects associated with the amount of Equivalent Roaded Area (an indicator of cumulative watershed effects).

- **Alternative G** is the same as alternative B but without group selection or individual tree selection units in watersheds where there is an increased potential for watershed effects associated with the amount of Equivalent Roaded Area (an indicator of cumulative watershed effects). Alternative G does not include the use of herbicides for noxious weed control or for DFPZ preventive maintenance.

Reviewers should provide the Forest Service with their comments during the review period for this *Slapjack Project Draft Environmental Impact Statement*. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the *National Environmental Policy Act* process so that it is meaningful and alerts the agency to the reviewers' position and contentions (*Vermont Yankee Nuclear Power Corp*. *v. NRDC*, 435 U.S. 519, 553 [1978]). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement (*City of Angoon v. Hodel*, 9th Circuit [l986] and *Wisconsin Heritages, Inc. v. Harris*, 490 F. Supp. 1334, 1338 [E.D. Wis. 1980]). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Send Comments to: James Peña, Forest Supervisor
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Date Comments Must Be Received: Comments must be received within 45 days of publication of the Notice of Availability in the *Federal Register*. Comments may be

- Mailed.

- Hand delivered between the hours of 8:00 a.m. and 4:30 p.m. weekdays.

- Faxed to (530) 283-7746.

- Electronically mailed to comments-pacificsouthwest-plumas@fs.fed.us. Please indicate "Slapjack Project" on the subject line of your email. Comments submitted electronically must be in "Rich Text Format" (rtf).

Summary

The Feather River Ranger District of the Plumas National Forest proposes to reduce hazardous fuels around rural communities to reduce the risk of high-intensity wildfires and to move the project area towards the desired future condition of a healthy, fire-resilient ecosystem. The proposed treatments include construction of a Defensible Fuel Profile Zone (DFPZ), group selection harvest, individual tree selection harvest, road system improvements, native plant and wildlife habitat improvements, meadow restoration, eradication of noxious weeds with herbicides in combination with other control methods, and preventive maintenance of DFPZs with herbicides.

This action is needed because forest stands in the Slapjack Project area are crowded with brush that has become increasingly more flammable with age. The numbers of thin-barked shade-tolerant trees, such as white fir, tanoak, and incense-cedar, have increased as a result of past fire suppression and management practices. Analysis of seral stage stand distribution in the Slapjack Project area on National Forest system land shows that the area is deficient in early seral stage (seedling and sapling sized) stands. Meadow habitat is being lost as a result of conifer encroachment, poorly located roads, and changes to hydrologic functions. Several poorly designed or maintained culverts in the project area have created barriers for aquatic-dependent species such as rainbow trout. Botanical surveys indicate the presence of noxious weed (nonnative invasive plants) infestations in the project area, including the highly flammable Scotch, French, and Spanish brooms.

The proposed project integrates several strategies aimed at reducing hazardous fuels, providing commercial products, and coordinating vegetation management activities with local communities. The legislation, strategies, and documents integrated into the Slapjack Project are as follows:

- Plumas National Forest Land and Resource Management Plan (the “Forest Plan” and Record of Decision [1988])
- Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG Act) (1998)
- HFQLG final environmental impact statement (EIS) and Record of Decision (1999)
- National Fire Plan (2000)
- Cohesive Strategy (2000)
- 10-year Comprehensive Strategy (2001)
- Healthy Forest Restoration Act (2003)
- Sierra Nevada Forest Plan Amendment final EIS and Record of Decision (2004)
- Challenge Landscape Assessment (2006)

Purpose and Need for Action

The need for the Slapjack Project is based on the current condition of resources and problems in the Slapjack Project area. The Forest Service developed the five purpose statements (which are also considered the objectives of the project) listed below as a method of categorizing the current condition of resources and resolving the various needs. The purposes of the Slapjack Project are to

- Protect rural communities in the Wildland Urban Interface by reducing the risk of a high-intensity wildfire by creating strategic Defensible Fuel Profile Zone s (DFPZs) approximately 0.25 mile wide. The DFPZs proposed in this project would add to a network of DFPZs already proposed and implemented on the Plumas National Forest landscape.

- To move toward the desired future condition of a healthy, fire -resilient ecosystem by establishing group selection and individual tree selection harvest units to test their effectiveness in establishing an uneven-aged (all-aged), multistoried, fire-resilient forest. Group selection would involve the harvesting of trees less than 30 inches diameter at breast height (dbh) from small (less than 2 acres) areas dispersed throughout the Forest matrix, resulting in various seral stages across the landscape.

- To provide an adequate timber supply that contributes to the economic stability of rural communities.

- To implement restoration projects to achieve healthy aquatic and riparian ecosystems.

- To control the spread of noxious weeds (nonnative invasive plants) within forest communities in order to maintain native plant diversity, natural communities, and DFPZ effectiveness.

Proposed Action (Alternative B)

Alternative B is the original action proposed to the public for scoping in September 2005 and is designed to move the project landscape toward a more fire-resilient condition, characterized by uneven-aged (all-aged), multistoried, fire-resilient stands. Alternative B includes the following actions:

- Reduce fire hazards by constructing approximately 15 miles of DFPZs on approximately 4,400 acres

- Harvest trees using group selection (219 acres) and individual tree selection (148 acres) harvest methods.

- Perform road work that includes 7 miles of road closure, 19 miles of road decommissioning, 17 miles of reconstruction, 4 miles of new temporary spur construction, light maintenance of 4 miles of existing spurs, and 2 miles of road resurfacing as part of a watershed improvement project.

- Restore and enhance aquatic, native plant, and wildlife habitat by removing or upgrading six culverts for fish passage improvement; restoring 59 acres of meadow; stabilizing 1,200 feet of streambank; and reducing fuel loads through underburning on 180 acres of California spotted owl habitat.

Alternative B proposes the use of herbicides to accomplish the following:

- Perform preventive maintenance of DFPZ units (1,954 acres) two to three years after DFPZ construction. The herbicide imazapyr would be used to control tanoak and shrub regrowth and prevent its re-formation as ladder fuels. Selection of this alternative would not determine how or even if DFPZs would be maintained long-term. Decisions regarding the long-term maintenance of the DFPZs would be made at the time such maintenance is determined to be necessary.

- Control noxious weeds (English ivy; barbed goat grass; yellow starthistle; French, Scotch, and Spanish brooms; and rush skeleton weed) on 33 acres with a variety of control tactics, including us of the herbicide triclopyr. Treatments would occur annually over a five-year period.

Noxious Weed Control and Eradication

Alternative B proposes to maintain native plant diversity, natural communities, and DFPZ effectiveness by controlling noxious weeds on 33 acres using a combination of tactics, including herbicide (triclopyr), hand pulling, and backpack torches. Control tactics and the target species are described below:

- Hand pulling would be used on various broom species, English ivy, barbed goat grass, and rush skeleton weed. This can be an effective control tactic for plants that do not reproduce by rhizomes (thick underground stems that produce roots and stems that develop into new plants). Plants should be pulled prior to dispersing seeds.

- Weed wrenches are tools specifically designed for manually removing deep-rooted woody perennial plants such as Scotch broom. Weed wrenches would be used on mature plants in the spring and winter when they are relatively easy to remove. A disadvantage of this technique is the inadvertent burial of broom seeds when plants are pulled out.

- Backpack torches use propane and a torch on a long wand. These units produce high-temperature flames and have been shown to be an effective tool on broom seedlings. The torches would be used in the winter and spring when there is no threat of fire escape.

- Brush cutters / string trimmers are motorized, hand-held cutting tools that can be used on annual grasses, yellow starthistle, and woody shrubs such as broom. The timing of the application is critical for success; for instance, cutting broom in the late summer when it is water stressed has been shown to be very effective.

- Underburning / prescribed fire can effectively control broom and other species if timed properly. Frequently, there is a flush of weed seedlings after underburns that must be killed before they set seeds.

- Herbicides applied with backpack sprayers may be used on broom seedlings. A foliar (leaf) application of triclopyr BEE in fall would effectively control French, Scotch, and Spanish broom seedlings. Herbicides would be used on a maximum of 31 of the 33 acres proposed for weed control; herbicide use would be concentrated in treatment units with existing broom populations.

Alternative Development

The Forest Service developed five alternatives (C, D, E, F, and G) to the proposed action based on issues identified by the Slapjack Interdisciplinary Team (ID Team) during the scoping process. The Forest Service also analyzed a no-action alternative—alternative A. The ID Team, in conjunction with the Responsible Official, developed alternatives to the proposed action in response to the following issues: (1) use of herbicides and (2) management activities in watersheds over the Threshold of Concern.

To provide a clear basis for choice among the alternatives, measurement indicators were identified that respond to the two issues listed above. Thus, the purpose and need, range of alternatives, environmental effects, and the final decision are discussed throughout this document in terms of the issues and the corresponding measurement indicators.

Alternative A (No Action)

Alternative A, the no-action alternative for the Slapjack Project, would not meet the intent of the 1988 *Plumas National Forest Land and Resource Management Plan* (the “Forest Plan”), as amended by the 1999 Record of Decision on the HFQLG final EIS and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS. Under alternative A, no fuels treatments, DFPZ construction, group selection or individual tree selection harvests, transportation system improvements, wildlife habitat improvements, or watershed restoration would be implemented to accomplish the purpose and need. The desired condition set forth in the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) of an uneven-aged (all-aged), multistory, fire -resilient forest would not be achieved, and the ecological health of the forest would not be improved and maintained.

Action Alternatives

This draft EIS presents the analysis of six action alternatives (B, C, D, E, F, and G). The action alternatives are the same in terms of DFPZ construction and individual tree selection harvest, canopy cover and diameter limits for tree removal, road system improvements, and restoration of wildlife, aquatic, and riparian ecosystems. All action alternatives address the overstory crown design criteria of 40 percent canopy cover described in “Appendix J: Fire and Fuels ” of the HFQLG Act final EIS. Because the action alternatives differ in the number of acres of group selection harvest treatments or by the method of DFPZ maintenance and noxious weed control, they vary in terms of cost, herbicide

use, treatment effectiveness, and watershed impacts. Alternative B (proposed action) is described above. The five other action alternatives considered in detail in the Slapjack Project draft EIS are summarized below.

Alternative C

Like alternative B, alternative C calls for the construction of approximately 4,400 acres of DFPZs and implementation of group selection (219 acres) and individual tree selection (148 acres). Road work and aquatic and wildlife habitat improvement activities would also occur as described for alternative B. However, unlike alternative B, alternative C does not propose the use of herbicides to control noxious weeds or brush regrowth on 1,954 acres of the DFPZs. Noxious weeds would instead be controlled on 33 acres in the project area using a variety of methods, including backpack torches and hand pulling.

Alternative C does not propose specific treatments for the future maintenance of DFPZs. Decisions regarding long-term DFPZ maintenance—including the specific treatments to be used—would be made when the time for maintenance of the natural stands is reached (approximately 10–20 years after initial treatment). Therefore, herbicide use for preventive maintenance of the DFPZs is essentially precluded under this alternative because herbicides have been shown to be most efficient and effective in delaying or preventing the buildup of understory fuels when used within about two years of the initial treatment (HFQLG final supplemental EIS, page 22).

Alternative D (Forest Service Preferred Alternative)

Alternative D proposes the same DFPZ construction, group selection, individual tree selection, road work, and aquatic and wildlife habitat improvement activities as alternative B. It also includes the use of herbicides in combination with other treatments to control noxious weeds on 33 acres. Unlike alternative B, alternative D does not propose the use of herbicide to control brush regrowth on 1,954 acres of the DFPZs. Alternative D does not propose specific treatments for the future maintenance of DFPZs. Decisions regarding long-term DFPZ maintenance—including the specific treatments to be used—would be made when the time for maintenance of the natural stands is reached (approximately 10–20 years after initial treatment). However, because herbicides have been shown to be most efficient and effective in delaying or preventing the buildup of understory fuels when used within about two years of the initial treatment (HFQLG final supplemental EIS, page 22), herbicide use for preventive maintenance of DFPZs is essentially precluded under this alternative.

Alternative E

Alternative E proposes the same DFPZ construction, group selection, individual tree selection, road work, and aquatic and wildlife habitat improvement activities as alternative B. Alternative E also proposes use of the herbicide imazapyr to control brush regrowth on 1,954 acres of the DFPZs within two to three years of initial treatment. Selection of this alternative would only determine how brush regrowth in the Slapjack DFPZs would be treated in the short term. Alternative E does not propose specific treatments for the future maintenance of DFPZs. Long-term maintenance of the DFPZs would only be determined after completion of appropriate documentation.

Unlike Alternative B, herbicides would not be one of the treatments used to control noxious weeds. Noxious weeds would instead be controlled on 33 acres in the project area using a variety of methods, including backpack flamers and hand pulling.

Alternative F

Alternative F proposes the same DFPZ construction, individual tree selection, road work, and aquatic and wildlife habitat improvement activities as alternative B. It also includes the use of herbicides to control brush regrowth on 1,954 acres of DFPZs and to control noxious weeds on 33 acres in combination with other treatments. Alternative D does not propose specific treatments for the future maintenance of DFPZs. Decisions regarding long-term DFPZ maintenance—including the specific treatments to be used—would be made when the time for maintenance of the natural stands is reached (approximately 10–20 years after initial treatment.

Unlike alternative B, this alternative would implement approximately 190 acres of group selection harvest instead of 219 acres because units located in watersheds predicted to be over the Threshold of Concern were dropped. Acres of individual tree selection units were not affected because no units are proposed in watersheds predicted to be over the Threshold of Concern.

Alternative G

Alternative G proposes the same DFPZ construction, individual tree selection, road work, and aquatic and wildlife habitat improvement activities as alternative B. Alternative G was developed to address watershed concerns, much like alternative F. Alternative G would implement approximately 190 acres of group selection harvest instead of 219 acres because units located in watersheds predicted to be over the Threshold of Concern were dropped. Acres of individual tree selection units were not affected because no units are proposed in watersheds predicted to be over the Threshold of Concern.

Alternative G does not propose the use of herbicides to control noxious weeds or the regrowth of brush on 1,954 acres of the DFPZ. Noxious weeds would instead be controlled on 33 acres in the project area using a variety of methods, including backpack torches and hand pulling.

Selection of alternative G would not make a decision on the future maintenance of the DFPZs. Decisions regarding long-term DFPZ maintenance—including the specific treatments to be used—would be made when the time for maintenance of the natural stands is reached (approximately 10–20 years after initial treatment). However, because herbicides have been shown to be most efficient and effective in delaying or preventing the buildup of understory fuels when used within approximately two years of the initial treatment (HFQLG FSEIS, p. 22), herbicide use for DFPZ maintenance is essentially precluded under this alternative.

Summary of Environmental Consequences

The environmental effects of each alternative considered in the Slapjack Project draft EIS are summarized below. The summary focuses on the environmental consequences of the five project objectives (see chapter 1, section 1.4) and the two issues raised by the public (section 1.8.2), as measured by a set of measurement indicators developed to show the differences between the

alternatives and provide a clear basis for the decision to be made by the Responsible Official. Additional effects for each resource area are described in "Chapter 3: Affected Environment and Environmental Consequences."

Environmental Consequences Related to Project Objectives

Objective 1:
Protect wildland rural communities from the risk of high-intensity wildfires.

Measurement Indicators Used in the Analysis for this Objective – flame length, fire type (crown or ground surface), tree mortality, fuel loading, and canopy base height.

Alternative A (No Action). Surface fuels, ladder fuels, and canopy fuels would not be modified over the short term; therefore, potential fire behavior would not change from the current condition. Fires would be expected to be more intense, resulting in a greater percentage of tree mortality. The Slapjack Project area would remain mostly in Condition Classes 2 and 3 and would have a moderate to high risk of losing key ecosystem components because the vegetation characteristics and fuel composition would not change. Flame lengths across the project area range from 2 to 7 feet and canopy base height conditions (1 to 3 feet) under the no-action alternative would allow surface fires to move into the crowns. Fuel and fire conditions under the no-action alternative would allow wildland fires to develop into either passive or active crown fires. Passive crown fires torch out individual or small groups of trees as the surface fuels burning under them provide the convective heat to ignite the above-ground fuels. Active crown fires spread from tree to tree in conjunction with the convective heat of the surface fuels burning under them.

All Action Alternatives. Flame lengths would be reduced from 2–7 feet, to 1–4 feet, by reducing surface fuels through underburning, piling and burning, or mastication. Fuel loading would be reduced by more than 57 percent across all units. The proposed treatments of hand and mechanical thinning, biomass removal, and mastication would increase canopy base height in most of the units from 1–3 feet to over 19 feet. Combined, the reduction in fuel loading and increased canopy base height would decrease the likelihood that surface fires would develop into crown fires. Prescribed burning would result in approximately 60 to 80 percent mortality in residual conifers, hardwoods (8 inches dbh and less), and most shrubs. This means that there would be a short-term increase in fire hazard in those units only treated by underburning. The reduction of surface fuels by underburning would mitigate this short-term hazard over the majority of the area.

Objective 2:
Promote a healthy uneven-aged, multistoried, fire-resilient forest.

Measurement Indicators Used in the Analysis for this Objective – Tree species composition, forest health (susceptibility to bark beetle infestation), stand structure, canopy cover, basal area, and tree density.

Alternative A. Currently, treatment units show a high proportion of smaller tree size classes, high fuel ladder potential, and interlocking crowns capable of sustaining crown fires. Maintaining the existing stand structure would favor shade-tolerant species such as white fir, tanoak, and incense-cedar. There would be little opportunity for the naturally dominant pine species to reestablish and regenerate themselves, except what may occur through natural large-scale disturbance events such as wildfire. In the absence of action, declining stand growth and vigor would put parts of the project area at high risk of insect and disease infestations. Stand health would continue to decline in overstocked aggregations of trees within

moderately stocked and densely stocked stands, eventually resulting in individual tree mortality. Mortality would increase the fuel loading, but endemic mortality would keep a continuous supply of dead trees for wildlife foraging and nesting.

Canopy cover in the treatment units ranges from 47 to 87 percent in CWHR class 4 and 5 stands and from 20 to 82 percent in CWHR class 3 (thin group), plantations (masticate group), and other stands (underburn group). Without treatment, the canopy closure in these stands, especially in the plantations, would continue to increase, shading out brush and smaller trees, which would die and increase the ladder fuels and fire hazard. Trees in the suppressed and intermediate crown classes would continue to provide ladder fuels into the overstory crown canopy.

All Action Alternatives. The effects discussed in this section would likely be the same for alternatives B, C, D, and E. Alternatives F and G call for fewer acres of group selection (190 acres compared to 219 in the other action alternatives), so they would result in slightly less change in species composition, forest health, and stand structure than described for alternatives B, C, D, and E.

In the treatment units, species composition would shift toward more shade-intolerant, fire - resistant species. Thinning would favor the retention of under-represented conifers (sugar pine and Douglas-fir), as well as oaks in those plantations dominated by ponderosa pine. Thinning would also favor retention of the most vigorous trees, rather than simply achieving desired spacing. This would result in increased species representation in the stands than what currently exists. The openings created by group selection would allow sunlight to reach the forest floor, creating favorable conditions for the establishment and growth of shade-intolerant, fire-adapted species.

Reducing tree density would improve tree growth and vigor, reduce susceptibility to drought and bark beetle attack, and reduce fire hazard. For all action alternatives, approximately 67 percent of the existing basal area would be retained for CWHR size class 4 and 5 stands. All action alternatives meet the requirements of retaining 30 percent of the existing basal area for CWHR 4 stands and 40 percent of existing basal area for CWHR 5 stands.

Post-treatment canopy cover would average 40 percent in DFPZs, 50 percent in individual tree selection units, and 60 percent in riparian habitat conservation areas (plantations only). All actions alternatives would meet the canopy requirements for CWHR class 4 and CWHR class 5 stands listed in table 2 of the SFNPA Record of Decision.

Thinning from below would remove ladder and canopy fuels. This would increase ground-to-crown height, spacing between trees, and spacing between tree crowns. All action alternatives would increase the quadratic mean diameters for treatment units (in CWHR size class 4 and 5 stands) from 11–12 inches dbh to 22–29 inches. This indicates that there would be a higher proportion of medium- to large-size trees in the stand, which would reduce the ladder fuels and fire hazard.

Objective 3:
Contribute to the stability and economic health of rural communities.

Measurement Indicators Used in the Analysis for this Objective – Number of direct and indirect jobs, total employee-related income, thinning, biomass removal, and fuel treatment revenues and costs.

Alternative A. This alternative would not reduce critical fuel loadings or harvest any timber. No funds would be generated for the U.S. Treasury or returned to local counties. No additional employment opportunities or wages paid to the primary and

service industries employees would be circulated through the local economy. No timber products (commercial firewood, biomass chips, or sawlogs) would be provided to the local economy.

All Action Alternatives. Alternatives B, C, D, and E would generate approximately 14 million board feet of sawlogs and 34,000 tons of biomass from the DFPZ, group selection, and individual tree selection units. Alternatives F and G would generate approximately 13.7 million board feet of sawlogs (due to reduction in acres of group selection to 190 acres compared to 219 acres in other alternatives) and 34,000 tons of biomass.

Net harvest revenues for thinning and biomass removal would generate $421,345 for alternatives B through E. Net harvest revenue for alternatives F and G would be slightly higher at $458,767. The group selections dropped from alternatives F and G have smaller trees and less volume per acre than average, increasing the value of sawlogs per acre and reducing the impact of harvesting costs. Implementation of mastication, underburning, and other fuel treatments for all action alternatives would cost $1,091,500.

Total project value, less the costs of DFPZ construction, noxious weed control treatments, and DFPZ preventive maintenance is estimated at -$1.2 million for alternatives B and E, -$713,000 for alternative C, -$703,000 for alternative D, -$1.15 million for alternative F, and -$676,000 for alternative G. The long-term project value includes the total net revenues or costs for implementing DFPZ construction activities, noxious weed control treatments, and DFPZ preventive maintenance as well as the estimated costs of long-term DFPZ maintenance projected over a 50-year period. Long-term project value, including 50 years of DFPZ maintenance, is estimated at approximately -$4.7 million for alternative B, -$5.1 million for alternative C, -$5.0 million for alternative D, -$4.7 million for alternatives E and F, and -$5.0 million for alternative G.

Thinning, biomass removal, and fuel treatments for alternatives B through E would generate a total of 267 employment opportunities (jobs resulting directly from harvesting and fuel reduction treatments and jobs resulting indirectly from opportunities at sawmills and energy generation plants). In comparison, alternatives F and G would generate 265 direct and indirect jobs. Total employee-related income would be approximately $11.5 million for alternatives B through E and $11.4 million for alternatives F and G.

Objective 4:
Promote healthy aquatic and riparian ecosystems.

Measurement Indicators Used in the Analysis for this Objective – miles of road decommissioned, feet of streambank stabilization, miles of fish habitat, and acres of meadow restored.

Alternative A. Under the no-action alternative, there would be no benefits to stream and meadow conditions. Sediment would continue to directly deposit into affected water bodies and riparian areas, and conditions would continue to degrade. Conifers and roads would continue to degrade meadow habitat. Fish barriers would remain in place and continue to obstruct the movement of aquatic species to suitable upstream habitat.

All Action Alternatives. All action alternatives would implement the decommissioning of 19 miles of roads, stabilization of 1,200 feet of streambank, removal or upgrade of 6 culverts to improve fish passage, and restoration of 59 acres of meadow habitat. A light underburn would reduce fuel loading on 180 acres of California spotted owl habitat.

Objective 5: Control the introduction and spread of noxious weeds.

Measurement Indicators Used in the Analysis for this Objective – canopy cover, relative disturbance of the various project activities, and acres of weeds post-treatment.

Alternative A. The current vulnerability to noxious weed invasion is low within the treatment units due to a high level of canopy cover and ground cover. However, the relative risk of noxious weed invasion for the landscape as a whole increases due to the high concentration of roads and logging operations on private land. Consequently, the overall habitat vulnerability is considered moderate to high. No control measures would be implemented in the project area to limit the spread of noxious weeds along roads or from adjacent private land.

All Action Alternatives. Proposed vegetation treatments (DFPZ construction, group selection, and individual tree selection) would disturb soil and remove overstory shade, resulting in a moderate risk of noxious weed invasion. There would also be a moderate risk of noxious weed invasion due to the building of temporary roads, road maintenance, and a short-term increase in vehicular traffic related to project activities. However, the closure and decommissioning of approximately 26 miles of road would reduce the long-term risk of noxious weed invasion through vectors. The project has been designed to use integrated management techniques to eliminate spread and contain current infestation on 33 acres in the project area. The control measures have been designed into the project and are included in all action alternatives.

Environmental Consequences Related to Issues Raised by the Public

Environmental consequences related to the two issues raised by the public (refer to chapter 1, section 1.8.2) are summarized below. Additional effects on each resource area are described in "Chapter 3: Affected Environment and Environmental Consequences."

Issue Statement 1: Some members of the public are opposed to the use of herbicides.

The indicator measures for this issue include

1. Acres and quantity of herbicide (as a means to evaluate potential exposure)
2. Cost per acre of treatment
3. Effectiveness of treatment

Alternative A. From 2000 through 2004, an average of 4.4 million pounds of herbicide by active ingredient were applied annually across Butte and Yuba Counties, primarily for road and utility right-of-way maintenance; rangeland improvement; noxious weed treatments; maintenance of orchards and flowerbeds, parks, and golf courses; and by individual rural home / land owners. Herbicides would not be applied for preventive maintenance of Slapjack DFPZs or noxious weed control under the no-action alternative, so there would be no project-related effects from herbicide use.

All Action Alternatives

Herbicides for DFPZ Preventive Maintenance: Alternatives B, E, and F — The herbicide imazapyr would be used to control brush regrowth on approximately 1,954 acres of the DFPZs within

2 to 3 years of construction. Imazapyr would be applied at a rate of 0.25 pounds of active ingredient per acre. The maximum application rate for this product is 0.75 pound of active ingredient per acre. A total of 489 pounds of active ingredients would be applied in order to implement the proposed DFPZ preventive maintenance approximately two to three years after DFPZ construction. The proposed additives (surfactant Syl-Tac® and a dye Hi-Light® Blue) are not expected to pose an adverse risk to the health and safety of workers or the public. This is based on available information from product labels and an overview by Bakke (USDA 2002) of the various types of additives likely to be used in forest herbicide applications.

The cost of the herbicide treatments is estimated at $250 per acre, for a total of approximately $489,000 for implementation of proposed DFPZ preventive maintenance. The total project values (including the present net value of accumulated future costs for long-term DFPZ maintenance) are described above in the section for the environmental consequences of objective 3.

For the vegetation types found in the Slapjack Project area, the HFQLG final supplemental EIS estimated that initial treatment of DFPZs would generally be effective for 5 years in the brush and plantation types and 10 years in mixed conifer and tanoak type. Subsequent maintenance was estimated to be needed at the same intervals (HFQLG final supplemental EIS pages 2-22 and 2-23). No applicable studies have been completed on shrub treatment under a canopy. The recently initiated "Alternatives to Fire for Fuel Reduction at California's Forest Urban Interface" (Powers et al. 2005) does give some indication of the effectiveness of different treatments. Second-growing-season results indicate that biomass from understory regrowth is much lower after the use of herbicides. Studies done in open-sky conditions, in clearcut, or in converted shrubfields indicate chemical treatment is 90–95 percent effective in reducing shrub cover over 10 to 12 years. These same studies indicate manual or mechanical treatment is about 80 percent effective in reducing shrub cover over the same period.

Herbicides for Noxious Weed Control: Alternatives B, D, and F — The herbicide triclopyr would be used to control noxious weeds in conjunction with a variety of other control tactics on a maximum of 31 of 33 acres analyzed for weed treatment. A total of 47 pounds of active ingredient would be applied annually over a five-year period, with a maximum of 233 pounds of active ingredient applied over the five-year period. The maximum application rate for this product is 4 pounds of active ingredient per acre. The proposed additives (surfactant Syl-Tac® and a dye Hi-Light® Blue) are not expected to pose an adverse risk to the health and safety of workers or the public. This is based on available information from product labels and an overview by Bakke (USDA 2002) of the various types of additives likely to be used in forest herbicide applications.

The cost of the noxious weed control program (including manual, mechanical, and chemical treatments) is estimated at $200 per acre, for a total of approximately $33,000 for implementation of the five-year noxious weed control program. The total project values are described above in the section on environmental consequences of objective 3.

An effective noxious weed control program—such as the one proposed for the Slapjack Project—incorporates multiple control tactics rather than relying on any one control tool. For alternatives B, D, and F, broom seedlings would be hand pulled and burned in the early spring. When these tools could no longer be used due to increased fire risk and hard soil in summer and fall, brush cutters and string trimmers would be used to cut plants when water stressed. When the use of motorized string trimmers

is restricted during periods of high fire danger, herbicides would effectively control broom seedlings. The use of herbicide in combination with other control tools may permit repeated treatments in a shorter period of time, increasing the likelihood of eradication.

No Herbicides for preventive maintenance: Alternatives C, d, and G — Herbicides would not be applied for preventive maintenance of Slapjack DFPZs. Preventive maintenance would not occur 2 to 3 years after DFPZ construction, so no costs would be incurred at that time. The total project values are described above in the section for the environmental consequences of objective 3. As discussed above, a recent study indicates that manual or mechanical treatment is about 80 percent effective in reducing shrub cover in open-sky conditions, in clearcut, or in converted shrubfields over a 10- to 12-year period, while chemical treatment is 90–95 percent effective.

No Herbicides for Noxious Weed Control: Alternatives C, E, and G — Herbicides would not be applied for noxious weed control. The cost of the noxious weed control program (incorporating manual and mechanical treatments) is estimated at $261 per acre, for an estimated total of $43,000 for implementation of the weed control program. The total project values are described above in the section for the environmental consequences of objective 3.

Under alternatives C, E, and G, the noxious weed control program would incorporate multiple control tactics including hand pulling, underburning, and mechanical treatments. There may be less chance of eradication or control of noxious weed infestations without the use of herbicides in combination with other control tools.

Issue Statement 2: Implementing ground-disturbing activities in watersheds that are approaching or over the Threshold of Concern increases the risk of adverse effects and cumulative watershed effects.

The indicator measure for this issue is the Equivalent Roaded Area score derived from the Forest Service Region 5 Cumulative Effects Model.

Alternative A. The Forest Service Region 5 Cumulative Effects Model (Equivalent Roaded Area or ERA) rating reflects the current conditions of the subwatersheds and the resulting impacts on the aquatic systems. At least 11 subwatersheds are over the Threshold of Concern (or TOC – an indicator of increased risk of cumulative watershed effects) and 8 are approaching the TOC in the existing condition.

Under alternative A, proposed treatments would not occur, and there would be no project-related increase in ERA values or in the risk of cumulative watershed effects. However, vegetation density and accumulation of fuels would continue, and the chances of stand-replacing fire that might affect upland watershed areas and near-stream sensitive areas would remain similar or increase compared to the existing condition. The ERA values following a stand-replacing fire would greatly exceed the TOC and greatly exceed projected increases in ERA from proposed treatment activities.

Action Alternatives

Under all action alternatives, 10 subwatersheds are expected to exceed the TOC and 7 are expected to approach the TOC. In the 10 subwatersheds that could exceed the TOC, the majority of

the ERA scores would be from private land timber harvesting, urban development, and roads. These three disturbance types constitute 80 to 90 percent of the total ERA scores. Alternatives F and G would not implement group selection harvest in watersheds over the TOC. The reduction of group acres from 219 acres to 190 acres for these two alternatives would result in less than a 1 percent difference in ERA scores between alternatives B through E and alternatives F and G.

Tribal Consultation

The following federally recognized tribes and interested and affected tribes were consulted regarding the Slapjack Project: Mooretown Rancheria, Enterprise Rancheria, Berry Creek Rancheria, Chico Band of Mechoopda Indians, and the Konkow Valley Band of Maidu Tribe.

Public Involvement

In 2003 the Forest Service began collaboration with a group of organizations interested in reducing wildland fire risk to communities and the environment in Butte and Yuba Counties. The Forest Service met regularly with a core group comprised of representatives from the Natural Resource Conservation Service; California Fire Safe Council; Butte Fire Safe Council; Yuba Watershed Protection and Fire Safe Council; the Quincy Library Group; Rancherias; industrial timberland owners, including Soper Wheeler and Chy Company; and other private landowners. Other groups or organizations involved include the Bureau of Land Management and the California Department of Forestry and Fire Protection. The Slapjack Project grew from this collaborative effort. In September 2004, the Forest Service helped organize the Eastern Butte / Yuba Fire Prevention Planning Tour, sponsored by the Butte Fire Safe Council and Yuba Watershed Protection and Fire Safe Council. The goal of the tour was to educate and promote a collaborative and coordinated planning process to address fuel reduction and fire prevention on a landscape scale.

Collaboration with the Butte Fire Safe Council and Yuba Watershed Protection and Fire Safe Council has been ongoing since 2003. Forest Service personnel have been in regular attendance at monthly Fire Safe Council meetings and have kept the councils and other stakeholders apprised of changes in project status.

In May 2005, a public meeting was held in Forbestown, California, to discuss opportunities in the six watersheds to be analyzed in the Challenge Landscape Assessment, including the Slapjack Project. Several attendees submitted comments, which were considered during the development of the proposed action and continue to shape the evaluation of the different management scenarios presented in this draft EIS. On September 14, 2005, a letter describing the proposed action (the “scoping” letter) was mailed to approximately 400 individuals and organizations, including local residents, Native American tribes, and federal, state, and local agencies. The letter was followed by the September 16, 2005, *Federal Register* publication of the Notice of Intent to prepare an EIS for the Slapjack Project. The Notice of Intent requested that comments on the proposed action be received within 30 days. Since publication of the Notice of Intent, more than 20 comment letters have been received.

Decision Framework

The Responsible Official for this project, Forest Supervisor James M. Peña, will decide whether to implement the Slapjack Project as identified in the proposed action, implement the project based on alternatives to the proposed action, or not implement the project at this time.

Timing

The project is scheduled to begin in the fall of 2006 and be completed by 2011. The general treatment schedules for DFPZs, group selection, and individual tree selection are shown in appendix B.

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Chapter 1: Purpose and Need for Action

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Chapter 1. Purpose and Need for Action

1.1 Introduction

This chapter describes the need for resource management activities in the proposed Slapjack Project area and identifies the project's geographic location. The objectives and needs for each proposed activity, and the measurement indicators used in the analysis for each objective, are discussed. Applicable laws, policies, other environmental impact statements (EISs), and direction that influence the scope of this analysis are described in this chapter. Also included is information about public involvement, scoping, and issues that guided the development of alternatives and the analyses of effects of the proposed action.

1.2 Proposed Action

The Slapjack Project is proposed as part of a broad resource management program to promote the ecological health of lands and economic health and stability of communities in the northern Sierra Nevada under the authority of the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act).

The United States Department of Agriculture (USDA) Forest Service, Plumas National Forest, Feather River Ranger District proposes to

- reduce fire hazards around rural communities by constructing Defensible Fuel Profile Zones (DFPZs);
- harvest trees using group selection and individual tree selection methods;
- perform associated road system improvement work; and
- carry out a range of aquatic and wildlife habitat improvement activities near Challenge, Feather Falls, and Clipper Mills, California.

The specific activities include the proposed use of ground-based and skyline logging systems to construct the DFPZs and to conduct timber harvest in individual tree selection and group selection units. Underburning, mastication, and manual cutting, piling, and burning would be used to construct DFPZs in units with no commercial timber harvest. Herbicides would be used to kill or suppress tanoak regrowth in some DFPZ units and to control infestations of noxious weeds and nonnative invasive plants, such as Scotch, Spanish, and French broom. A detailed description of the proposed action appears in "Chapter 2: Alternatives."

1.3 Background Information

1.3.1 Relationship of the Slapjack Project to the HFQLG Pilot Project

Congressman Herger and Senator Feinstein were authors of legislation that was signed into law on October 21, 1998, that provided direction for a Pilot Project to demonstrate the management activities championed by the Quincy Library Group. The Quincy Library Group is comprised of interested local citizens who have a commitment to influence the management of the Lassen and Plumas National Forests and the Sierraville District of the Tahoe National Forest. The HFQLG Pilot Project is designed to demonstrate the effectiveness of fuelbreaks, group selection, individual tree selection, avoidance or protection of specified areas, and implementing a program for riparian restoration. The Slapjack Project was developed as part of this Pilot Project, and the Pilot Project treatment options were incorporated into the Slapjack Project design.

1.3.2 Project Location

The proposed Slapjack Project area would be located in Butte and Yuba Counties, California, and within the Feather River Ranger District of the Plumas National Forest (see “Figure 1-1. Slapjack Project vicinity map”). The project area would comprise approximately 34,725 acres of public and private land and would generally be situated between Lake Oroville to Dobbins on the west; the North Yuba River to Wambo Bar on the east; and from Barton Hill to the town of Feather Falls to the north. The proposed DFPZs would be located primarily on prominent ridges and around urban areas. The group selection units would be distributed throughout the DFPZs and in some adjacent areas. The individual tree selection units would occur, where needed, throughout the remaining forest matrix. The project area would include portions of Management Areas 10 (Feather Falls) and 11 (Challenge) as described in the 1988 *Plumas National Forest Land and Resource Management Plan* (commonly referred to as the “Forest Plan”).

The legal description of the project area is as follows: Township (T) 20N, Range (R) 6E, portions of Sections 15, 23, 25, 26, and 34; T20N, R8E, portion of Section 32; T19N, R6E, portions of Sections 2-5, 9, 11, and 14; T19N, R7E, portions of Sections 1, 8, 11, 12, 13, 16-21, and 27-34; T19N, R8E, portions of Sections 4, 5, and 6; and T18N, R7E, portions of Sections 2, 3, 12, 14, 22, 23, 26, and 34, Mount Diablo Base and Meridian. The area ranges in elevation from approximately 1,300 to 3,800 feet above mean sea level.

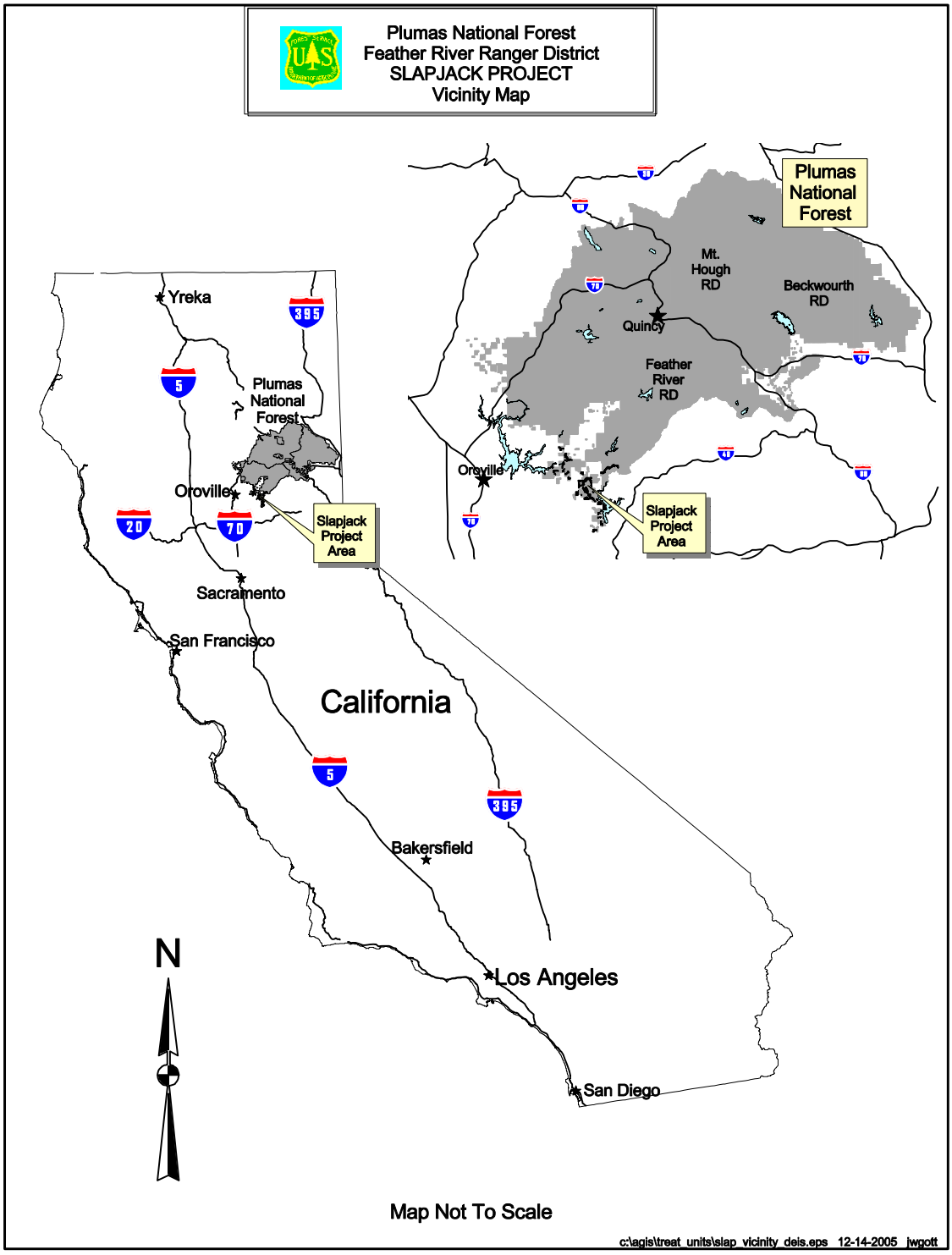

Figure 1-1. Slapjack Project vicinity map.

1.4 Purpose and Need

1.4.1 Introduction

The Forest Service interdisciplinary team developed five primary objectives for the Slapjack Project based on site-specific resource problems in the area, laws, and Forest Service direction. These objectives led to the development of specific treatments and activities (described in the "Alternatives" section of chapter 2) designed to maintain or establish a trend to desired resource and social conditions.

The following sections list the project objectives, the underlying needs for taking action, legislation and policy direction for the objectives, and measurement indicators. The measurement indicators are used in the analysis to quantify and describe how well the proposed action and alternatives meet the project objectives.

1.4.2 Project Objectives and Needs for Action

Objective 1:
Protect wildland rural communities from the risk of high-intensity wildfires.

Need for action – forest stands in the Slapjack Project area are crowded with brush that has become increasingly more flammable with age. Also, the numbers of thin-barked, shade-tolerant trees (such as white fir, tanoak, and incense cedar) have increased as a result of past fire suppression and management practices. These crowded stand conditions are increasing the risk of high-intensity fire by providing more continuous fuel from surface fuels to live fuels (brush, hardwoods, and conifers).

There are seven communities in or adjacent to the project area (Brownsville, Challenge, Clipper Mills, Dobbins, Feather Falls, Forbestown, and Strawberry Valley). The total population in the project area is approximately 5,000 to 7,000 people, with hundreds of scattered houses and structures in the Wildland Urban Interface. Many of these local property owners are concerned about the threat of wildfire to their property due to the build up of forest fuels. A partial network of DFPZs has been proposed and implemented on the Plumas National Forest and on private lands in the project area (see figure A-8 in appendix A). The DFPZ network is currently incomplete in the Slapjack Project area.

Wildland fire control in the Slapjack Project area is the responsibility of the Nevada, Yuba Placer, and Butte Ranger units of the California Department of Forestry and Fire Protection; the Foothill Fire Protection District; and the Plumas National Forest. Current fuels conditions and access in the Slapjack Project area make firefighting difficult. Heavy brush and dense timber stands slow fireline construction and limit strategic control points, which are important for efficient wildfire control and firefighter safety. Some access roads in the project area are also overgrown with brush—this lengthens response time to wildfires and makes access difficult for suppression activities and assisting with evacuation.

Applicable Legislation and Policy Direction – 1998 HFQLG Act; 2004 Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS and Record of Decision; 1988 Forest Plan, as amended by the 1999 HFQLG final EIS and Record of Decision; National Fire Plan of 2001; *Healthy Forest Restoration Act of 2002*.

Measurement Indicators Used in the Analysis for this Objective – flame length, fire type (crown or ground surface), tree mortality, fuel loading, and canopy base height.

Objective 2:
Promote a healthy uneven-aged, multistoried, fire-resilient forest.

Need for action – many forest stands in the project area have unnaturally high numbers of shade-tolerant trees. These crowded stands are less fire resilient and are under stress from competition for water, light, and nutrients.

Analysis of the distribution of seral stage stands in the Slapjack Project area shows that the area is deficient in early seral stage stands (seedlings and saplings). Historically, 10 percent of the area was estimated to be in the early seral stage; however, only 2 percent of National Forest System lands in this area are currently in an early seral condition.

The Slapjack Project area is within the regional HFQLG Pilot Project. As such, an annual average of 8,700 acres of timber harvest using group selection is mandated across the Pilot Project area. The intent is to test the effectiveness of group selection in establishing an uneven-aged, multistoried, fire-resilient forest. To date, there have been no group selection harvests in the Slapjack Project area.

Applicable Legislation and Policy Direction – 1998 HFQLG Act; 2004 SNFPA final supplemental EIS and Record of Decision; and the 1988 Forest Plan, as amended by the 1999 HFQLG final EIS and Record of Decision

Measurement Indicators Used in the Analysis for this Objective – Tree species composition, Forest health (susceptibility to bark beetle infestation), stand structure, canopy cover, basal area, and tree density.

Objective 3:
Contribute to the stability and economic health of rural communities.

Need for action – There are several communities (within reasonable haul distance from the project area) that are highly dependent upon the forest products industry for jobs and revenues. The local factors influencing the economies of Butte and Yuba Counties include isolation from urban job markets, reliance on natural resource-based industries, and high seasonal fluctuations in employment. In the local environments, forest health and community economic health share interdependent goals. Timely timber sales in Butte and Yuba Counties contribute a proportional supply of timber to local communities that are highly dependent on the forest products industry.

Applicable Legislation and Policy Direction – 1998 HFQLG Act; 2004 SNFPA final supplemental EIS and Record of Decision; and the 1988 Forest Plan, as amended by the 1999 HFQLG final EIS and Record of Decision

Measurement Indicators Used in the Analysis for this Objective – Number of direct and indirect jobs, total employee-related income, thinning, biomass removal, and fuel treatment revenues and costs.

Objective 4:
Promote healthy aquatic and riparian ecosystems.

Need for action – there are approximately 26 miles of National Forest System and nonsystem roads in the project area that have been identified as unnecessary. These roads are not being maintained and contribute to water quality impacts.

Several poorly designed or maintained culverts in the project area have created barriers for some aquatic-dependent species such as rainbow trout. The culverts are isolating fish populations and obstructing movement for their migration, reproduction, and survival.

Wet meadow habitat is being lost as a result of conifer encroachment, poorly located roads, and changes to hydrologic functions.

Past activities in the project area have caused some stream channel instability. Consequently, some streambanks are being undercut and widening.

Applicable Legislation and Policy Direction – 1998 HFQLG Act, Clean Water Act, National Forest Management Act.

Measurement Indicators Used in the Analysis for this Objective – miles of road decommissioned, feet of streambank stabilization, miles of fish habitat, and acres of meadow.

Objective 5:
Control the introduction and spread of noxious weeds.

Need for action – botanical surveys indicate the presence of Scotch, French, and some Spanish broom on approximately 10 acres. These high-priority noxious weeds are currently concentrated along roads and disturbed areas in the project area and have also been found spreading into DFPZs and group selection units. These noxious weeds can reduce the effectiveness of fuels reduction projects by forming thick walls of highly flammable vegetation. In addition, they compete with and alter native plant communities.

Applicable Legislation and Policy Direction – 1998 HFQLG Act; 2004 SNFPA final supplemental EIS and Record of Decision; 1988 Forest Plan, as amended by the 1999 HFQLG final EIS and Record of Decision; and Executive Order 13112 for the control of noxious weeds

Measurement Indicators Used in the Analysis for this Objective – canopy cover, relative disturbance of the various project activities, and acres of weeds post-treatment.

1.5 Laws, Regulations, EISs, and Other Direction that Influence the Scope of this EIS

1.5.1 Herger-Feinstein Quincy Library Group Forest Recovery Act

On October 21, 1998, the President of the United States signed the *Department of the Interior and Related Agencies Appropriations Act*, including section 401—the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act). The HFQLG Act states that the Secretary of Agriculture, acting through the Forest Service, and after completion of an EIS, shall conduct a pilot project (the

HFQLG Pilot Project) for five years on federal lands in the Lassen and Plumas National Forests and the Sierraville District of the Tahoe National Forest.

The HFQLG Pilot Project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities in meeting ecologic, economic, and fuel-reduction objectives. Full implementation of the HFQLG Pilot Project would result in an annual average of 8,700 acres of group selection across the Pilot Project area, consistent with protection of ecosystems, watersheds, and other forest resources; good silvicultural practices; and economic efficiency. The proposed group selection prescriptions of the Slapjack Project would contribute toward achieving this goal.

1.5.2 HFQLG EISs and Records of Decision (1999 and 2003)

The HFQLG Act final EIS was completed on August 17, 1999, and the Record of Decision was signed on August 20, 1999 (USDA Forest Service 1999a). The Record of Decision amended the land and resource management plans for the three National Forests (Plumas, Lassen, and Tahoe) and gave direction to implement the resource management activities required by the HFQLG Act. The Record of Decision on the HFQLG final supplemental EIS addressing DFPZ maintenance was adopted on July 31, 2003 (USDA Forest Service 2003a). In February 2003, the *Department of the Interior and Related Agencies Appropriations Act* was signed and extended the HFQLG Pilot Project legislation by another five years.

1.5.3 SNFPA Final Supplemental EIS (2004)

In January 2004, the Regional Forester signed the SNFPA final supplemental EIS Record of Decision, which replaced the 2001 Record of Decision on the SNFPA final EIS and changed management direction to allow full implementation of the HFQLG Pilot Project, consistent with the goals identified in the HFQLG Act. The 2001 SNFPA final EIS and Record of Decision are incorporated by reference in the 2004 Record of Decision on the SNFPA final supplemental EIS.

The 2004 Record of Decision on the SNFPA final supplemental EIS directed the Plumas National Forest to implement the HFQLG Pilot Project, which includes creation of DFPZs for the proposed Slapjack Project, along with nearby DFPZs in the Lower Slate and South Fork project areas and treatments on private lands. These treatments are needed in order to limit the potential size and loss of resources (including homes) from large, high-intensity wildfire. The DFPZs are strategically located and designed strips of land where surface fuels (excess down woody material), ladder fuels, and canopy fuels are treated so that large, destructive canopy fires will lose intensity and transition to surface fires. The DFPZs are wide enough to capture most short-range spot fires in the treated area and are designed to provide fire suppression personnel a safe location from which to take fire-suppression actions. DFPZs are usually located along roads, ridgetops, meadows, or rocky areas to enhance their effectiveness and accessibility.

1.5.4 Forest Plan Direction

The 1988 *Plumas National Forest Land and Resource Management Plan* (otherwise known as the “Forest Plan”), as amended by the 1999 HFQLG final EIS Record of Decision, and as amended by the 2004 SNFPA final supplemental EIS Record of Decision, guides the proposed action and

alternatives. The 2004 SNFPA Record of Decision (page 68) displays the standards and guidelines applicable to the HFQLG Pilot Project area. Land allocations that apply to this proposal include Off Base and Deferred Lands, late-successional old-growth stands, California spotted owl Protected Activity Centers, Spotted Owl Habitat Areas, and National Forest System lands outside these allocations that are available for vegetation and fuels management activities.

1.5.5 Challenge Landscape Assessment (2006)

The Challenge Landscape Assessment identifies opportunities for improvement to the existing conditions found in the Slapjack Project area. The five objectives described above were derived from this report.

1.6 Decision Framework

The Responsible Official for this project, Forest Supervisor James M. Peña, will decide whether to implement the Slapjack Project as identified in the proposed action, implement the project based on alternatives to the proposed action, or not implement the project at this time.

1.7 Project Schedule

The Responsible Official expects to make a decision on this project in June of 2006, with implementation to begin in fall of 2006.

1.8 Public Involvement

1.8.1 Scoping Process

The Forest Service began collaboration in 2003 with a group of organizations interested in reducing wildland fire risk to communities and the environment in Butte and Yuba Counties. The Forest Service met regularly with a core group comprised of representatives from the Natural Resource Conservation Service; California Fire Safe Council; Butte Fire Safe Council; Yuba Watershed Protection and Fire Safe Council; the Quincy Library Group; Rancherias; industrial timberland owners, including Soper Wheeler and Chy Company; and other private landowners. Other groups or organizations involved include the Bureau of Land Management and the California Department of Forestry and Fire Protection. The Slapjack Project grew from this collaborative effort. In September 2004, the Forest Service helped organize the Eastern Butte / Yuba Fire Prevention Planning Tour, sponsored by the Butte Fire Safe Council and Yuba Watershed Protection and Fire Safe Council. The goal of the tour was to educate and promote a collaborative and coordinated planning process to address fuel reduction and fire prevention on a landscape scale.

Collaboration with the Butte Fire Safe Council and Yuba Watershed Protection and Fire Safe Council has been ongoing since 2003. Forest Service personnel have been in regular attendance at monthly Fire Safe Council meetings and have kept the councils and other stakeholders apprised of changes in project status.

In May 2005, a public meeting was held in Forbestown to discuss opportunities in the six watersheds to be analyzed in the Challenge Landscape Assessment, including the Slapjack Project. Several attendees submitted comments, which were considered during the development of the proposed action and continue to shape the evaluation of the different management scenarios presented in this draft EIS. On September 14, 2005, a letter describing the proposed action (the "scoping" letter) was mailed to approximately 400 individuals and organizations, including local residents, Native American tribes, and federal, state, and local agencies. The letter was followed by the September 16, 2005, *Federal Register* publication of the Notice of Intent to prepare an EIS for the Slapjack Project. The Notice of Intent requested that comments on the proposed action be received within 30 days. More than 20 comment letters have been received since publication of the Notice of Intent.

1.8.2 Scoping Issues

Issues are points of discussion, debate, or dispute about the potential environmental impacts of a proposed action. As such, issues influence the design and evaluation of alternatives to the proposed action. Issues can be categorized as either nonsignificant or significant. The Council on Environmental Quality (CEQ) regulations for implementing the *National Environmental Policy Act* guide federal agencies in handling nonsignificant issues by directing them to ". . . identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review" (CEQ section 1506.3; 40 Code of Federal Regulations [CFR] 1501.7).

Nonsignificant issues are those that are (1) already addressed by law, regulation, forest plan, or other higher level decision; (2) beyond the scope of the purpose and need described in the Notice of Intent; (3) not connected to the proposed action; (4) conjectural and not supported by scientific or factual evidence; or (5) irrelevant to the decision to be made.

The Interdisciplinary Team (ID Team), through the interdisciplinary process and in coordination with the Responsible Official, looked at internal issues (brought up by the interdisciplinary team) and external issues (from public scoping comments) to provide a basis for the analysis of environmental effects (contained in chapter 3 of this EIS). To narrow the focus of the environmental analysis, the ID Team focused on issues that provided measurable elements to the proposed action and emphasized the most important environmental effects. These are elements of the ecosystem that can be measured to indicate an increase or decrease in trends in ecosystem health. To compare these elements, indicators and appropriate measures were developed to show the differences between the alternatives and provide a clear basis for a decision to be made by the Responsible Official. Thus, the purpose and need, range of alternatives, environmental effects, and final decision will be connected using the scoping comments, internal issues, and the corresponding indicator measures. The issues for the Slapjack Project are summarized below.

Issue Statement 1: Some members of the public are opposed to the use of herbicides.

Opposition to the use of herbicides mainly centered on concerns about people and animals being exposed to or ingesting herbicides. Commenters expressed concern about the potential for herbicides to be toxic to people, especially sensitive populations such as those with compromised immune systems, children, and the elderly. Commenters expressed concern about the risk of contamination of groundwater, private water systems, and wells. There was a concern about the cumulative and long-

term effects on Native people and their cultural practices due to herbicide exposure on land and through water. There was a concern about herbicides and potential toxicity to amphibians. There was concern about people who live near the project area and whether people would need to stay away from the project area.

There were also concerns that herbicide use would not be effective and that using herbicides to create the DFPZs would make them more flammable. There was concern that using herbicides to eradicate invasive species would facilitate establishment of another invasive weed species rather than restoring native species.

The indicator measures for this issue include

1. Acres and quantity of herbicide (as a means to evaluate potential exposure)
2. Cost per acre of treatment
3. Effectiveness of treatment

Issue Statement 2: Implementing ground-disturbing activities in watersheds that are approaching or over the Threshold of Concern increases the risk of adverse effects and cumulative watershed effects.

At least 11 subwatersheds are over the Threshold of Concern and 8 are approaching the threshold in the existing condition. The Region 5 Cumulative Effects Model (Equivalent Roaded Acres) rating reflects existing subwatershed condition and resulting impacts on the aquatic systems.

The indicator measure for this issue includes

1. The Equivalent Roaded Acres score derived from the Region 5 Cumulative Effects Model.

1.9 Permits, Licenses, and other Consultation Requirements

No federal permits, licenses, or entitlements are necessary to implement the proposed project. State requirements, based on federal laws, and administered by the County Agricultural Commissioner for air quality management and herbicide use, will be followed. These requirements include burning only on permissive burn days, or receiving a special variance prior to ignition, as well as the use of Certified Pesticide Applicators for herbicide treatments. Smoke permits are required from the Feather River and Butte County Air Quality Management Districts. Timber Harvest Activity Waivers are required from the California Regional Water Quality Control Board.

The Forest Service consulted with federal and state agencies, including the United States Fish and Wildlife Service (USFWS) and California Department of Fish and Game, during the development of this EIS. Details of these consultations are in “Chapter 4: Consultation and Coordination.” In addition, the Forest Service consulted the following federally recognized tribes and interested and affected tribes: Mooretown Rancheria, Enterprise Rancheria, Berry Creek Rancheria, Chico Band of Mechoopda Indians, and the Konkow Valley Band of Maidu.

1.10 Document Structure

This *Slapjack Project Draft Environmental Impact Statement* (draft EIS) varies slightly from the organization established by CEQ regulations (40 CFR 1500-1508). This document has a combined "Affected Environment and Environmental Consequences" chapter in order to provide consolidated information on each resource. The list of preparers and list of agencies, organizations, and persons to whom copies of this EIS have been sent are combined into "Chapter 4 Consultation and Coordination" rather than having two very short chapters. The EIS consists of the following chapters:

- **Chapter 1: Purpose of and Need for Action**
- **Chapter 2: Alternatives**
- **Chapter 3: Affected Environment and Environmental Consequences**
- **Chapter 4: Consultation and Coordination**
- **Acronyms, Glossary, Index, and References**
- **Appendices**

The document also includes a cover sheet, summary, and table of contents consistent with the regulations.

Chapter 2: Alternatives

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Chapter 2. Alternatives

2.1 Introduction

The United States Department of Agriculture (USDA) Forest Service, Plumas National Forest, Feather River Ranger District proposes to reduce fire hazards around rural communities by constructing Defensible Fuel Profile Zones (DFPZs), harvesting trees using group selection and individual tree selection methods, performing associated road system improvement work, and carrying out a range of aquatic and wildlife habitat improvement activities near Forbestown, Challenge, Feather Falls, and Clipper Mills, California.

Ground-based and skyline logging systems would be used to construct the DFPZs and to conduct timber harvest in individual tree selection and group selection units. Underburning, mastication, and manual cutting, piling, and burning would be used to construct DFPZs in the units with no commercial timber harvest. Herbicides would be used to kill or suppress tanoak regrowth in some DFPZ units and to control infestations of noxious weeds (also called nonnative invasive plants) such as Scotch, Spanish, and French broom.

2.2 Description of the Alternatives

The Council on Environmental Quality (CEQ) regulations for implementing the *National Environmental Policy Act* (NEPA) require federal agencies to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 Code of Federal Regulations [CFR] 1502.14).

The Forest Service Interdisciplinary Team (ID Team) reviewed public comments and data collected during the 2002–2005 field seasons to identify issues related to the proposed action. The ID Team focused on issues that provide comparative measures between the proposed action and other management scenarios considered for this project. The ID Team, in conjunction with the Responsible Official, developed alternatives to the proposed action in response to the following issues: (1) use of herbicides and (2) management activities in watersheds over the Threshold of Concern.

To provide a clear basis for choice among the options, indicator measures were used to compare how each alternative responded to the two issues listed above. The seven alternatives listed below were analyzed in detail by resource area (see “Chapter 3: Affected Environment and Environmental Consequences”). The treatments proposed for each alternative range from maintaining existing canopy cover (up to 90 percent in the no-action alternative) to an average of 40 percent canopy cover in all action alternatives.

- **Alternative A** (the no-action alternative) addresses the CEQ requirement to analyze a no-action alternative and the potential effects of taking no action.
- **Alternative B** (the proposed action) calls for approximately 4,400 acres of DFPZ construction, 219 acres of group selection, and 148 acres of individual tree selection; transportation system improvements; control of noxious weeds on 33 acres; and wildlife,

aquatic, and riparian ecosystem restoration. This alternative includes the use of herbicides for preventive maintenance of DFPZs (1,954 acres) and as a tactic to control noxious weeds (on a maximum of 31 of the 33 total acres).

- **Alternative C** proposes the same suite of actions as alternative B, but herbicides would not be used for preventive maintenance of DFPZs or to control noxious weeds.
- **Alternative D** (Forest Service preferred alternative) would implement DFPZs, group selection, and individual tree selection; transportation system improvements; control of noxious weeds; and wildlife, aquatic, and riparian ecosystem restoration as described under alternative B. However, preventive maintenance of DFPZs with herbicides would not be performed.
- **Alternative E** would implement DFPZs, group selection, and individual tree selection; transportation system improvements; control of noxious weeds; and wildlife, aquatic, and riparian ecosystem restoration as described under alternative B. However, herbicides would not be one of the methods used to control noxious weeds.
- **Alternative F** would implement DFPZs and individual tree selection; transportation system improvements; control of noxious weeds; and wildlife, aquatic, and riparian ecosystem restoration as described under alternative B. However, this alternative calls for 190 acres of group selection, instead of 219 acres, because group selections located in watersheds predicted to be over the Threshold of Concern have been dropped. This alternative includes the use of herbicides for preventive maintenance of DFPZs and as a tactic to control noxious weeds.
- **Alternative G** would implement DFPZs and individual tree selection; transportation system improvements; control of noxious weeds; and wildlife, aquatic, and riparian ecosystem restoration as described under alternative B. Like alternative F, this alternative calls for 190 acres of group selection because group selections located in watersheds predicted to be over the Threshold of Concern have been dropped. Herbicides would not be used for preventive maintenance of DFPZs or to control noxious weeds.

2.2.1 Alternative A: No Action

Alternative A, the no-action alternative for the Slapjack Project, would not meet the intent of the 1988 *Plumas National Forest Land and Resource Management Plan* (the “Forest Plan”), as amended by the 1999 Record of Decision on the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) final environmental impact statement (EIS) and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS. The desired condition set forth in the HFQLG Act of an uneven-aged (all-aged), multistory, fire-resilient forest would not be achieved, and the ecological health of the forest would not be improved and maintained.

Under alternative A, no fuels treatments, DFPZ construction, group selection or individual tree selection harvests, transportation system improvements, wildlife habitat improvements, or watershed restoration would be implemented to accomplish the purpose and need.

Under this alternative, forest conditions would continue to change in response to natural and human factors. With fire exclusion, an understory of fir and cedar has developed beneath the overstory, creating a multistoried stand with moderate to dense canopy closure. The canopy closure currently ranges from 31 to 90 percent in California Wildlife Habitat Relationship (CWHR) size class 4 and 5 stands (cover from trees less than 6 inches dbh do not count toward CWHR canopy cover). The canopy closure for the plantations and other stands ranges from 12 to 82 percent. Trees in stands considered for treatment would continue to grow, and canopy closure in these stands, especially in overstocked stands, would continue to increase. Brush and smaller trees would be shaded out and die, thus increasing ladder fuels and fire hazard. Conifer encroachment on riparian areas and meadows would gradually increase. Compared to alternative B (the proposed action), there would be an increased risk of wildfire, which could cause substantial loss of forest cover and degrade watersheds and wildlife habitat. Insect attacks could cause tree mortality, which would increase fire hazard. No fuel-reduction or restoration opportunities would be implemented.

If the Slapjack Project is not implemented, the main National Forest System roads in the area would remain in a condition that is less than satisfactory, allowing poor road access for the public and fire management to persist in some areas. Roads in good condition would continue to provide access for emergency response, woodcutting, mining, sightseeing, and other recreational activities. Roads not closed or decommissioned would continue to contibute to accelerating erosion processes, thus altering water quality and aquatic habitat and increasing cumulative watershed effects.

This EIS describes the effects of the no-action alternative because it serves as a baseline for comparison of the effects of the action alternatives. Alternative A complies with the CEQ regulations for implementing NEPA (40 CFR 1502.14(d)).

2.2.2 Action Alternatives

This draft EIS presents the analysis of six action alternatives. The action alternatives are the same in terms of DFPZ construction and individual tree selection harvest, canopy cover and diameter limits for tree removal, road system improvements, and restoration of wildlife, aquatic, and riparian ecosystems (see table 2-1). All action alternatives address the overstory crown design criteria of 40 percent canopy cover described in “Appendix J: Fire and Fuels” of the HFQLG Act final EIS. Because the action alternatives differ in the number of acres of group selection harvest treatments or by the method of DFPZ maintenance and noxious weed control, they vary in cost, herbicide use, treatment effectiveness, and watershed impacts. An example of a proposed treatment schedule for typical DFPZ, individual tree selection, and group selection units is displayed in appendix B.

2.2.2.1 Alternative B (Proposed Action): Implement DFPZs, Group Selection, and Individual Tree Selection; Maintain Portions of DFPZs with Herbicides; and Control Noxious Weeds with Herbicides, Mechanical and Manual Methods, and Prescribed Burning

Alternative B is the original action proposed to the public for scoping in September 2005. It is designed to move the project landscape toward more fire-resilient condition, characterized by uneven-aged (all age), multistoried, fire-resilient stands. The indicators used to evaluate this alternative include cost of treatments, effectiveness, and quantity of herbicide to be applied. Alternative B includes the following actions, which are described in more detail below:

Table 2-1. Summary of proposed treatments, by alternative.

	Alternatives						
	A	**B**	**C**	**D**	**E**	**F**	**G**
DFPZ Construction (Acres)							
1. Manual Treatments	0	87	87	87	87	87	87
2. Mechanical Treatments	0	3,671	3,671	3,671	3,671	3,671	3,671
3. Thermal Treatments	0	661	661	661	661	661	661
4. Chemical Treatments	0	0	0	0	0	0	0
Totals	**0**	**4,419**	**4,419**	**4,419**	**4,419**	**4,419**	**4,419**
DFPZ Preventive Maintenance 2-3 Years After Construction (Acres)							
1. Chemical (imazapyr)	0	1,954	0	0	1,954	1,954	0
Group Selection Harvest (Acres)							
1. Inside DFPZ units	0	123	123	123	123	99	99
2. Outside DFPZ units	0	96	96	96	96	91	91
Total	**0**	**219**	**219**	**219**	**219**	**190**	**190**
Individual Tree Selection (Acres)							
1. Outside DFPZs	0	148	148	148	148	148	148
Noxious Weed Control (Acres)							
1. Manual, mechanical, and thermal tactics only	0	0	33	0	33	0	33
2. Manual, mechanical, thermal, and chemical tactics[a]	0	33	0	33	0	33	0

Table 2-1. Summary of proposed treatments, by alternative (continued).

	Alternatives						
	A	B	C	D	E	F	G
Transportation System Improvements (Miles)							
1. Road reconstruction	0	22	22	22	22	22	22
2. Road decommissioning	0	19	19	19	19	19	19
3. Road closure	0	7	7	7	7	7	7
3. Temporary spurs	0	4 new 4 existing	4 new 4 existing	4 new 4 existing	4 new 4 existing	4 new 4 existing	4 new 4 existing
Wildlife and Aquatic Habitat Improvements							
1. Culvert upgrades to improve fish passage	0	6	6	6	6	6	6
2. Meadow restoration (acres)	0	59	59	59	59	59	59
3. Streambank stabilization (feet)	0	1,200	1,200	1,200	1,200	1,200	1,200
4. Underburn in spotted owl habitat (acres)	0	180	180	180	180	180	180

Note:

a. The herbicide triclopyr would be used to treat a maximum of 31 of the 33 acres proposed.

- Reduce fire hazards by constructing approximately 15 miles of DFPZs on approximately 4,400 acres.
- Harvest trees using group selection (219 acres) and individual tree selection (148 acres) harvest methods.
- Perform road work that includes approximately 7 miles of road closure, 19 miles of road decommissioning, 22 miles of reconstruction, 4 miles of new temporary spur construction, 4 miles of light maintenance of existing spurs, and 2 miles of road resurfacing as part of a watershed improvement project.
- Restore and enhance aquatic, native plant, and wildlife habitat by removing or upgrading six culverts for fish passage improvement; restoring 59 acres of meadow; stabilizing 1,200 feet of streambank; and reducing fuel loads on 180 acres of spotted owl habitat through underburning.

Treatment 1 – DFPZ Construction. A DFPZ is a strategically located and designed strip of land (averaging approximately 0.25 mile wide) on which surface fuels (both living and dead), ladder fuels, and canopy fuels are treated in order to limit the potential size and loss of resources (including homes) from large high-intensity wildfire. DFPZs are wide enough to capture most short-range spot fires within the treated areas and are designed to provide fire suppression personnel safe locations from which to take fire-suppression actions during 90th percentile weather conditions. DFPZs are usually located along roads, ridgetops, meadows, or rocky areas to enhance their effectiveness and accessibility. Approximately 15 miles of DFPZs would be constructed on approximately 4,400 acres along the ridges (see figure A-1 in appendix A; this figure is comprised of five maps).

These fuel reduction units have been specifically designed to complement similar treatments occurring on the adjacent network of DFPZ projects. The Slapjack DFPZs would be part of a larger, strategic system of DFPZs on the Plumas, Lassen, and Tahoe National Forests, as well as fuel reduction treatments on adjacent private timber lands. The proposed fuel treatments would be consistent with the goals of the National Fire Plan.

The DFPZs would be situated to avoid HFQLG Act Off Base and Deferred Lands, California spotted owl Protected Activity Centers, cultural resource sites, Spotted Owl Habitat Areas, federally listed Threatened and Endangered plant species, and old-forest stands (California Wildlife Habitat Relationship [CWHR] size classes 5M, 5D, and 6) in late-successional old-growth rank 4 and 5 stands.

Treatments throughout the DFPZs would involve thinning from below to remove ladder and canopy fuels in order to increase ground-to-crown height, spacing between trees, and spacing between tree crowns. Treatment prescriptions would call for removal of the smaller, suppressed, and intermediate crown-class trees; removal of some codominant and dominant trees; and retention of the largest trees to achieve the target canopy cover or spacing guidelines. Thinning in DFPZs would be intended to reduce canopy cover to approximately 40 percent in those units where it presently exceeds that amount.

Plantations do not have any canopy cover restrictions and would be thinned to a residual spacing of approximately 18 to 25 feet, depending on average residual tree size, to allow retention of the healthiest, largest, and tallest conifers and black oaks. Where California black oak is present in certain DFPZs, an average basal area of 25 to 35 square feet per acre would be retained for oaks over 15 inches diameter at breast height (dbh). Smaller oaks may be retained if determined necessary for future recruitment.

An estimated 230 acres (9 percent) of the total 5,612 acres of the treatment units would be in Riparian Habitat Conservation Areas (RHCAs). Treatments in RHCAs would include underburning, hand piling, and hand thinning, except in some plantations where mastication or harvest is prescribed. In these plantations, the mechanical treatment would remove or masticate trees to within 25 to 50 feet of the edge of the stream. Underburns would be ignited above the RHCA, and fire would be allowed to back downslope into them.

Underburning, machine pile and burning, mastication, or hand piling and burning would be used to treat residual slash, pre-existing fuels, and shrubs. After completion of burning, residual fuels less than 3 inches in diameter would not exceed 5 tons per acre. Where down logs exist, an average over the treatment unit of 10 to 15 tons per acre of large down wood would be retained. An average of four snags per acre would be retained. Firelines would be constructed around machine piles, hand piles, and underburn units to prevent fire escape.

Treatments and prescribed burn objectives would depend upon terrain and existing surface and ladder fuel conditions in each unit and would meet the design criteria presented in “Appendix J: Fire and Fuels” of the 2003 HFQLG final EIS and the 2004 SNFPA Record of Decision. Descriptions of the proposed treatment methods are provided below and summarized in table 2-2.

Table 2-2. Proposed treatments in Slapjack Project DFPZs.

Primary Treatment	Secondary Treatment[a]	DFPZ Treatment Acres	Acres of Group Selection	Total Acres of Treatments
Total acres of harvest in DFPZs and group selection: 2,561				
• Mechanized Thinning and Biomass Removal (Size Class 4)	Underburning or mastication	800	65	865
• Thinning and Biomass Removal (Size Class 3)	Underburning or mastication	1,257	61	1,318
• Thinning and Biomass Removal (Plantations)	Mastication	378	0	378
Total acres of mastication: 1,110				
• Mastication (Plantations)	Pruning	419	0	407
• Mastication (Non-plantations)	Underburn	640	0	703
Total acres of hand cut, pile, and burn: 87				
• Hand cut and pile	Burn piles	87	0	87
Total acres of underburning: 661				

Note:

a. The secondary treatment method would be determined based on residual ladder and surface fuels and available burning windows.

- **Mechanized thinning and biomass removal** – Treatments throughout the DFPZs would involve thinning from below to remove ladder and canopy fuels in order to increase ground-to-crown height, spacing between trees, and spacing between tree crowns. Approximately 40 percent canopy cover would be retained in all treatment units, except in plantations. The priority for thinning would be the removal of the smaller, suppressed, and intermediate-crown class trees; and removal of some codominant and dominant trees with crowns underneath and adjacent to healthy large trees. The preferred species for residual trees are shade-intolerant species where they exist. In order of preference, the shade-intolerant species are ponderosa pine, black oak, Jeffrey pine, sugar pine, Douglas-fir, incense-cedar, and true fir. For stands that are not in plantations, the spacing of residual conifers would be approximately 25 feet apart (plus or minus 6.25 feet), to allow for retention of the healthiest, largest, and tallest conifers and to avoid creating openings without going below a minimum of 40 percent canopy cover for the CWHR size class 4 stands. The CWHR size class 3 stands and stands in plantations do not have any canopy cover restrictions. Sawlog diameter limits would range from 9 to 29.9 inches dbh, and biomass limits would be from 3 to 8.9 inches dbh. All trees 30 inches dbh or larger would be retained, unless removal was required for operability.

- **Mastication –** Woody shrubs and trees would be masticated using mechanical ground-based equipment to grind harvest residue or thinnings, except in those portions of RHCAs where mechanical treatment would not be allowed. Shrubs and trees less than 10 inches dbh would be masticated, unless the trees are needed for proper spacing. Most masticated trees would be less than 6 inches dbh. Spacing of residual conifers and black oaks in plantations would range from 18 feet to approximately 25 feet apart. The spacing would be wider in units with larger size trees, but 40 percent canopy cover would be retained. This would allow retention of the healthiest, largest, and tallest conifers and black oaks and would avoid creating openings. Underburn would be the final treatment where objectives (fuel loads less than 5 tons per acre) are not being met with mastication.

- **Hand cutting and piling of trees and shrubs and pile burning** – Shrubs and trees that are 1 to 6 inches dbh would be manually cut from beneath overstory trees, and/or aggregations of small-diameter conifers or plantation trees would be thinned. The cut trees, shrubs, and existing slash would be manually piled and burned. The spacing of residual conifers and black oaks would be approximately 18 feet (plus or minus 4.5 feet) to allow retention of the healthiest, largest, and tallest conifers and black oaks and to avoid creating openings.

- **Underburning** – A prescribed burn under an existing canopy of trees (hardwoods or conifers) would be designed to reduce excess live and dead vegetation. Firelines would be constructed by mechanical or manual methods. This type of burning would be initiated when fuel moistures are low enough to carry fire and still be within prescription parameters. Burning would only be initiated on “Burn Days” designated by the California State Air Quality Control Board.

- **Firelines**

  – *Hand lines* would be scraped to mineral soil to a minimum width of 2 feet and vegetation cleared to a minimum width of 6 feet. Dead fuel would be scattered away from the mineral soil scrape to reduce fireline intensities.

  – *Machine lines* would be scraped to mineral soil to a minimum width of 6 feet and vegetation cleared to a minimum width of 10 feet.

- **Hand thinning and piling in RHCAs** – Depending on local site conditions, hand thinning would be used in the RHCAs where mechanical equipment is excluded. In such areas, conifers from 3 feet in height to 6 inches in diameter would be hand thinned to a spacing of about 15 feet. All hardwoods and riparian vegetation would be retained. Wherever possible, hand piles would be located away from riparian vegetation to prevent scorching.

- **Preventive maintenance of DFPZs** – Herbicides are proposed to maintain DFPZ effectiveness on 1,954 acres in stands where tanoak makes up 10 percent or more of the stand composition by basal area, and where canopy cover would be reduced to 40 percent. Herbicides have been shown to be most efficient and effective in delaying or preventing the buildup of understory fuels (by changing vegetation from shrubs to grasses, forbs, or ferns) when used within approximately two years of the initial treatment (HFQLG final supplemental EIS, page 22). The 28 DFPZ units (1,954 acres) proposed for preventive maintenance are listed in appendix B and shown on figure A-2 in appendix A. For the 2,456 acres in the DFPZ units not proposed for herbicide treatment, maintenance would follow the schedule outlined in the HFQLG final supplemental EIS for mechanical, hand, and prescribed fire treatments, with the first maintenance occurring approximately 10 to 20 years after DFPZ construction. Because these activities would not be implemented for about 10 years, they are not proposed at this time.

  – Tanoak and shrub regrowth on approximately 1,954 acres in the project area would be treated with the herbicide imazapyr. A non-ionic surfactant would be added to the mix to increase the effectiveness of imazapyr by helping it spread over and penetrate the leaves. Two additives (or adjuvants – substances that help the effectiveness of herbicides) would be used for this project: the surfactant SYL-TAC® (or equivalent seed oil / silicone blend) and the marker dye Hi-Light® Blue (or equivalent) to indicate where herbicides have been applied. Imazapyr is the herbicide most widely used in forestry applications in Butte, Plumas, and Yuba Counties. The Slapjack Project proposes to use the same application rates of imazapyr (see table C-1 in appendix C) as analyzed in the HFQLG final supplemental EIS; therefore, a separate human health risk assessment is not required. The hazard analysis, exposure assessment, dose response assessment, risk characterizations, tables, and worksheets that pertain to imazapyr are hereby incorporated by reference from appendix G of the HFQLG final supplemental EIS. More information about herbicides and public and worker safety is found in the “Human Health and Safety” section of chapter 3 and appendix C of this EIS.

- **Threatened, Sensitive, Proposed, and Special Interest (collectively called "Rare") plant species** – Certain rare plant species have been located in the proposed DFPZ units, and treatment would depend on the abundance of plants in the treatment unit and the particular characteristics of the species. Mitigations (see appendix F), including limited operating periods and controlled areas, would delay proposed treatment until the species is no longer in leaf and flowering. Another mitigation would include marking plants to protect them from proposed treatments. In some cases, an underburn may be prescribed to reduce excess live and dead vegetation. Firelines would be constructed by manual means only to avoid damaging rare plants. This type of burning would be initiated when fuel moistures are low enough to carry fire within prescription parameters, preferably in the fall.

Treatment 2 – Group Selection. Group selection would be conducted on approximately 219 acres in and adjacent to the DFPZ treatment units (see table 2-3 and figure A-1 in appendix A; figure A-1 consists of five maps). The group selection units are listed in tables B-4 and B-5 in appendix B. Group selection would involve the harvest of trees less than 30 inches dbh from small (less than 2 acres) areas dispersed throughout the project area, resulting in uneven aged (all-aged) forests across the landscape. The groups would range in size from 0.5 acre to 2 acres and average about 1.5 acres. Group selection would be designed to promote regeneration of an additional cohort (group) of shade-intolerant, fire-resilient species and develop a variety of stand structures across the landscape to increase resilience to disturbances such as fire, drought, and pests. Where possible, black oaks would be avoided in the placement of the groups. In DFPZ treatment units, the total acreage of group selections would not exceed 10 percent of the total DFPZ unit area, as recommended by Weatherspoon (1996). Outside of DFPZs, groups would be placed at a rate of approximately 11.4 percent of the unit area, although they could be placed at up to 20 percent of the stand area in some units. Groups would generally be located on the fringe of DFPZs and away from roads and other primary control points (refer to "Appendix J: Fire and Fuels" of the HFQLG final EIS).

Table 2-3. Proposed acres of group selection timber harvest.

Allocation	Analyzed Stand Acres	Acres Available for Group Selection	Group Selection Acres	Number of Groups
Inside of DFPZs	4,600	2,289	123	83
Outside of DFPZs[a]	1,012	843	96	64
Totals	**5,612**	**3,132**	**219**	**147**

Note:

a. In three units, individual tree selection would be conducted in the forested area surrounding the proposed group selection openings. See the selection below titled "Treatment 3 – Individual Tree Selection (Area Thinning)" for more information.

There are approximately 3,132 acres available for group selection in the Slapjack Project area. This total takes certain land allocations into account, meaning that implementation of group selection may not be possible on all 5,612 acres that were analyzed for group selection placement (refer to table 2-3). Group selection harvest units would not be located in HFQLG Act Off Base and Deferred Lands; spotted owl and northern goshawk Protected Activity Centers; Spotted Owl Habitat Areas; recreation sites; Challenge Experimental Forest; CWHR size class 2 stands; Riparian Habitat Conservation Areas; areas containing cultural resources; Threatened, Endangered, Proposed or Sensitive plant populations; and late-successional old-growth size ranks 4 and 5.

The treatment types that would be implemented in group selection units are described below. The generalized silvicultural prescription schedules are included in appendix B.

- **Timber harvest** – Trees (including hardwoods) that would be removed would be less than 30 inches dbh, except larger trees may be removed on an incidental basis to allow for operability, if approved by a Plumas National Forest employee officially designated under the appropriate timber sale or service contract by the Contracting Officer. Desirable conifers (those that are undamaged, healthy, and shade intolerant) and all black oaks greater than 30 inches dbh would be retained.

- **Site preparation** – Machine piling and burning or hand piling and burning would be used to treat residual slash, pre-existing fuels, and shrubs in group selection openings. After completion of burning, residual fuels (less than 3 inches in diameter) would not exceed 5 tons per acre. Where down logs exist, an average over the treatment unit of 10 to 15 tons per acre of large down wood would be retained. In stands scheduled for mastication, or stands that would not receive any secondary treatment, hand lines would be constructed around machine piles and hand piles to prevent fire escape.

- **Reforestation** – Approximately five years after harvest in group selection openings, a combination of natural regeneration and plantings would be used to achieve desired stocking levels of new stands dominated by shade-intolerant fire-resilient species (such as ponderosa pine, Douglas-fir, black oak, and sugar pine).

- **Release** – These are treatments would be used to control vegetation that is competing with planted and naturally regenerated trees. Competing plants would include noxious weeds that are present or have re-invaded the area after site preparation treatments. To be effective, release treatments would involve the removal of vegetation in a 5-foot radius around each tree. Release work should be timed and coordinated with fire management staff to reduce burn intensities and improve plantation survival.

Treatment 3 – Individual Tree Selection (Area Thinning). Individual tree selection harvest, or area thinning (called for in the Record of Decision on the SNFPA final supplemental EIS, table 2 on pages 68–69), would be conducted on about 148 acres in three units surrounding some group selections in the Slapjack Project area that are outside of DFPZs (see figure A-1 in appendix A and table B-6 in appendix B). Individual tree selection would enhance the health and vigor of the stand. A sanitation cut, combined with thinning from below, would be designed to prevent the spread of insects and disease and reduce overstocking. Treating areas immediately around group selection would leave

the stand in a more vigorous state by removing the diseased, decadent, and suppressed trees and would also improve the economic efficiency of the project.

Harvesting would be done with whole-tree ground-based and cable logging systems. Slash from harvesting activities would be piled and burned. The individual tree selection prescriptions would be designed to meet Forest Plan standards set forth in the 2004 Record of Decision on the SNFPA final supplemental EIS (page 69). This would include the retention of 50 percent canopy cover after treatment (averaged within the unit) and retention of all live trees with a dbh of 30 inches, except if needed to be removed for operability. Slash and some existing fuels would be piled to reduce ground fuels if the amount is over the retention standards for wildlife, hydrology, and soil resources.

Treatment 4 – Transportation System Improvements. In most cases, the existing system of roads, landings, and skid trails would be used to access treatment units and for product removal. There are approximately 200 miles of roads in the project area. The proposed transportation system improvement work is listed below and identified on figure A-3 in appendix A (this figure is comprised of three maps).

- Approximately 7 miles of existing system roads would be closed with barriers upon project completion.
- Approximately 19 miles of existing system or nonsystem roads would be decommissioned during project implementation.
- Approximately 22 miles of existing system roads would be reconstructed prior to project use. Reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts where needed. Another 2 miles would be resurfaced as part of a watershed improvement opportunity.
- Approximately 4 miles of temporary spurs would be constructed, and 4 miles of existing spurs would receive light maintenance to clear the road bed of young vegetation and debris.
- Harvest landings in group selection units and DFPZs would be constructed or reconstructed as needed.

Through project planning, the public was given the opportunity to participate and comment on proposed road closures and decommissioning. The Plumas National Forest is currently undergoing an off-highway vehicle (OHV) route inventory and designation process. Roads proposed for decommissioning or closure under the Slapjack Project would not be closed until the OHV process has been completed, unless the following criteria apply:

- Dead-end spurs or routes that show no evidence of OHV use, which are also contributing to resource damage.
- User-created routes in areas that are already closed by existing Forest Orders.
- Routes that are creating unacceptable resource damage, to the extent that a delay in their closure would result in unacceptable and irretrievable impacts on the resource.

Treatment 5 – Control of Noxious Weeds (Nonnative Invasive Plant Species). A total of 33 acres in the project area are proposed for noxious weed control (see figure A-4 in appendix A for the locations of proposed noxious weed treatment units and table B-4 in appendix B for the list of units). The noxious weeds that are known to occur in the proposed treatment units include Scotch, French, and Spanish broom, yellow starthistle, and English ivy. Of those, Scotch broom (*Cytisus scoparius*), French broom (*Genista monpessulana*), and Spanish broom (*Spartium junceum*) are of particular concern. These species thrive in disturbed areas and can form dense, impenetrable thickets of vegetation. When present in large concentrations, it is suspected that these species can modify fire frequency and intensity. Currently, approximately 10 acres of broom are known to occur in treatment units, with additional populations on surrounding private land.

Although there is relatively little broom within proposed treatment units at this time, the disturbance associated with this project has the potential to create conditions favorable for broom proliferation. For that reason, 17 treatment units (31 of the total 33 acres) were analyzed for herbicide use in anticipation of a potential flush of broom seedlings following project activities. It is more likely that herbicides would be used on a smaller scale, concentrating on those units with existing broom infestations. Proposed weed control treatments are designed to prevent existing populations of broom and other noxious weeds from becoming established and spreading uncontrolled. Control tactics and the target species are described below:

- Hand pulling would be used on various broom species, English ivy, barbed goat grass, and rush skeleton weed. This can be an effective control tactic for plants that do not reproduce by rhizomes. Plants would be pulled prior to dispersing seeds.

- Weed wrenches are tools specifically designed for manually removing deep-rooted woody perennial plants such as Scotch broom. Weed wrenches would be used on mature plants in the spring and winter when they are relatively easy to remove. A disadvantage of this technique is the inadvertent burial of broom seeds when plants are pulled out.

- Backpack torches use propane and a torch on a long wand. These units produce high-temperature flames that have been shown to be an effective tool on broom seedlings. These torches would be used in the winter and spring when there is no threat of fire escape.

- Brush cutters / string trimmers are motorized, hand-held cutting tools that can be used on annual grasses, yellow starthistle, and woody shrubs such as broom. The timing of the application is critical for success. For instance, cutting broom in the late summer when it is water stressed has been shown to be a very effective.

- Underburning / prescribed fire can effectively control broom and other species if timed properly. Frequently, there is a flush of weed seedlings after underburns that must be killed before they set seeds.

- Herbicides applied with backpack sprayers may be used on broom seedlings. A foliar (leaf) application of triclopyr BEE in the fall would effectively control French, Scotch, and Spanish broom seedlings. The Slapjack Project proposes to use the same application rates of triclopyr (see table C-2 in appendix C) as analyzed in the HFQLG final supplemental EIS; therefore, a separate human health risk assessment is not required. The hazard

analysis, exposure assessment, dose response assessment, risk characterizations, tables, and worksheets that pertain to triclopyr are hereby incorporated by reference from appendix G of the HFQLG final supplemental EIS.

Treatment 6 – Wildlife, Aquatic, and Riparian Ecosystem Restoration

Aquatic and riparian ecosystem restoration – Watersheds in the project area have been heavily influenced by past logging activities, roads, mining, wildfires, urban development, and hydrologic facilities. These influences have modified stream conditions, resulting in alteration of flow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, and riparian condition in watersheds. The Slapjack Project includes the following restoration activities to improve aquatic and riparian ecosystem conditions in the project area.

- **Fish passage improvements** – Six culverts in the project area have been identified for upgrades to provide fish access to upstream habitat. The proposed wildlife, aquatic, and riparian ecosystem restoration activities are shown on figure A-1e in appendix A.
  - *Culvert 1: Indian Creek, 19N03 road crossing (T19N, R7E, Section 21 SE 1/4)* – Improving or replacing this culvert would add 1 mile of upstream habitat to the 0.25 mile of habitat currently existing below the culvert.
  - *Culvert 2: Indian Creek, 19N09 road crossing (T19N, R7E, Section 27 NW 1/4)* – Improving or replacing this culvert would add another 0.25 mile of upstream habitat to the 1.5 miles of habitat currently existing below the culvert.
  - *Culvert 3: Deadwood Creek, 20N24 road crossing (Y20N, R8E, Section 33 SW 1/4)* – Improving or removing this culvert would provide 0.75 mile of upstream habitat. This culvert would be a candidate for removal because the 20N24 road has been decommissioned.
  - *Culverts 4 and 5: Hampshire Creek and tributary, 20N25 road crossing (T19N R7E, Section 1)* – Two culverts on this road are undersized and causing streambank erosion downstream. This road has been identified for stabilization and closure. The culvert on Hampshire Creek would be upgraded, and the streambank would be stabilized to prevent further degradation of water quality and evaluated for fish passage improvement. Road 20N25 is contributing a large amount of sediment into the stream and wetland and would be stabilized. The road, road crossings, and wetland are located on both private and National Forest System lands and would need to be analyzed with the landowner (Soper Wheeler).
  - *Culvert 6: Hampshire Creek, 20N24 road crossing (T19N, R7E, Section 1)* – Fish are currently found upstream of the culvert, but the drop below the culvert does not meet standards for fish passage. Upgrading this culvert would connect upstream and downstream habitat and improve fish passage.

- **Streambank stabilization** – Streambank erosion is a natural wearing away of soil and rock that form streambanks. Poorly maintained or improperly designed or located roads and stream crossings have accelerated this natural process in some areas, leading to an alteration in flow, sediment lading, sediment transportation and deposition, channel morphology, channel stability, substrate composition, and riparian conditions. These conditions have degraded both water quality and aquatic habitat. To address known problems in the project area, the proposed action includes an element of streambank stabilization to restore bank stability to streambanks with rock, coir (coconut fiber) logs, and vegetation.

  – *Streambank 1: Units 29, 30, and 26 (T19N, R7E, Sections 19, 20, 30, and 31)* – These units have streams that are incised with eroding banks and headcuts that are migrating upstream. Rock and/or coir log check dams would be needed to stabilize the streams.

  – *Streambank 2: Unit 85 (T19N, R7E, Section 6)* – A temporary road below a meadow is disrupting natural channel flow and causing streambank erosion. A headcut is moving upstream towards a meadow. The headcut would be repaired with rock and the temporary road stabilized.

- **Road decommissioning or closure** – There are numerous unsurfaced roads in the Slapjack Project area contributing to the degradation of water quality and aquatic habitat. The proposed road decommissioning, closures, or reconstruction would contribute to watershed restoration, meadow enhancement, fish passage, and streambank stabilization. The elevation in the project area is low, which makes it is accessible year-round. The heavy public use of roads in the project area is causing rutting during wet weather. For those roads that would be decommissioned and/or closed, the roadbed would be stabilized or removed, culverts would be pulled, and stream crossings would be stabilized. Roads proposed for closure or decommissioning would be evaluated against the ongoing OHV route inventory and designation process described above under "Treatment 4 – Transportation System Improvements."

- **Meadow enhancement** – Conifer encroachment has led to a loss of meadow habitat. To help reverse this loss, competing conifers would be removed from selected meadow areas by hand cutting to encourage desired late seral meadow vegetation. Streambanks would be stabilized with large rocks, willow cuttings, and/or coir logs to restore hydrologic function and to maintain and improve this habitat.

  The following opportunities for meadow enhancement have been identified:

  – *Meadow 1* – Approximately 15 acres of meadow habitat in units 26, 29, 30, 329, 11, 52, and 85 are proposed for treatment.

  – *Meadow 2* – Approximately 17 acres in size and located along the 20N24 road in the northern section of the Slapjack Project area, northeast of Ponderosa Reservoir at T20N R6E S25 1/4 SW. The meadow would be enhanced by removing brush and competing conifers along the perimeter.

- *Meadow 3* – Approximately 8 acres in size and located east of meadow 1, along the 20N24 road in the northern section of the Slapjack Project area at T20N R6E S25 1/4 SE. The meadow would benefit from removal of manzanita, *Ceanothus*, and some encroaching conifers.

- *Meadow 4* – Approximately 14 acres in size and located southeast of meadow 2. It is connected to meadow 2 by an unnumbered road and is adjacent to power lines at T20N R6E S25 1/4 SE, T20N R7E S30 1/4 SW. The meadow would be enhanced by removal of encroaching conifers.

- *Meadow 5* – A small meadow (less than 1 acre) located southwest of meadow 1 at T20N R6E S36 1/4 NE. It could be enhanced by removing brush and competing conifers along the perimeter.

Habitat enhancement for the California spotted owl – The dry forest types found in the project area have been altered as a result of past logging, livestock grazing, and fire suppression. These past changes in forest structure have lead to increases in fuel hazards and the probability of future stand-replacing fires. A catastrophic fire could remove suitable habitat for species associated with late-successional forests, specifically the California spotted owl. Although owl prey requires some level of vegetative cover, an understory that is too dense makes it difficult for owls to forage.

A low-intensity prescribed burn would be used as a tool to reduce fuel loads—accumulated woody debris and thick understory vegetation—in a California spotted owl Protected Activity Center (PAC) and Spotted Owl Habitat Area (SOHA) (see figure A-9 in appendix A). This activity is an opportunity to facilitate fire's natural return and improve forest ecosystem health, thereby enhancing suitable habitat for the owl. There could be an initial short-term effect as a result of disturbance from fuels treatment, but the treatments could also result in long-term habitat enhancement for the owls and their prey.

The following areas are proposed for fuels treatment (see figure A-9):

- Unit 24, PAC YU024 (34 acres)

- Unit 925, PAC YU024 (57 acres)

- Unit 62, SOHA B1 (89 acres)

2.2.2.2 Alternative C: Implement DFPZs, Group Selection, and Individual Tree Selection as in the Proposed Action; Maintain DFPZs without Herbicides; and Control Noxious Weeds without Herbicides

Like alternative B, alternative C calls for the construction of approximately 4,400 acres of DFPZs and implementation of 219 acres of group selection and 148 acres of individual tree selection (see figure A-1 in appendix A for the location of these treatment units). Road work and aquatic and wildlife habitat improvement activities would also occur as described for alternative B. However, unlike alternative B, alternative C does not propose the use of herbicides to control noxious weeds or

brush regrowth on 1,954 acres of the DFPZs. Noxious weeds would instead be controlled on 33 acres in the project area using a variety of methods, including backpack torches and hand pulling.

Alternative C does not propose specific treatments for the future maintenance of DFPZs. Decisions regarding long-term DFPZ maintenance—including the specific treatments to be used—would be made when the time for maintenance of the natural stands is reached (approximately 10–20 years after initial treatment). Therefore, herbicide use for preventive maintenance of the DFPZs is essentially precluded under this alternative because herbicides have been shown to be most efficient and effective in delaying or preventing the buildup of understory fuels when used within about two years of the initial treatment (HFQLG final supplemental EIS, page 22).

Alternative C addresses the concern that herbicides used to control noxious weeds and remove brush in the DFPZs would result in adverse effects on humans and the environment. Alternative C addresses a public comment that maintenance of DFPZs can be done by mechanical and prescribed burning. The indicators include weighing the cost of herbicide use against other means of removal and the quantity of herbicide needed.

2.2.2.3 Alternative D: Implement DFPZs, Group Selection, and Individual Tree Selection as in the Proposed Action; Maintain DFPZs without Herbicides; and Control Noxious Weeds with Herbicides

Alternative D is the Forest Service preferred alternative. It proposes the same DFPZ construction, group selection, individual tree selection, road work, and aquatic and wildlife habitat improvement activities as alternative B. It also includes the use of herbicides in combination with other treatments to control noxious weeds on 33 acres. Unlike alternative B, alternative D does not propose the use of herbicides to control brush regrowth on 1,954 acres of the DFPZs.

Alternative D does not propose specific treatments for the future maintenance of DFPZs. Decisions regarding long-term DFPZ maintenance—including the specific treatments to be used—would be made when the time for maintenance of the natural stands is reached (approximately 10–20 years after initial treatment). Therefore, herbicide use for preventive maintenance of the DFPZs is essentially precluded under this alternative because herbicides have been shown to be most efficient and effective in delaying or preventing the buildup of understory fuels when used within about two years of the initial treatment (HFQLG final supplemental EIS, page 22).

Alternative D addresses the concern that using herbicides to maintain DFPZs would result in adverse effects on humans and the environment. It addresses a public comment that maintenance of DFPZs can be done by mechanical methods and prescribed burning. The indicators include cost of treatments, effectiveness, and quantity of herbicide needed.

2.2.2.4 Alternative E: Implement DFPZs, Group Selection, and Individual Tree Selection as in the Proposed Action; Maintain DFPZs with Herbicides; and Control Noxious Weeds without Herbicides

Alternative E proposes the same DFPZ construction, group selection, individual tree selection, road work, and aquatic and wildlife habitat improvement activities as alternative B. Alternative E also proposes the use of the herbicide imazapyr to control brush regrowth on 1,954 acres of the DFPZs

within two to three years of initial treatment. Selection of this alternative would determine if brush regrowth in the Slapjack Project DFPZs would be treated in the short term (two to three years after construction). This alternative does not prescribe specific treatment methods for the long-term maintenance of the DFPZs.

Unlike alternative B, herbicides would not be one of the treatments used to control noxious weeds. Noxious weeds would instead be controlled on 33 acres in the project area using a variety of methods, including backpack torches and hand pulling.

Alternative E addresses the concern that using herbicides to control noxious weeds would result in adverse effects on humans and the environment and that alternate methods are available. The indicators include cost of treatments, effectiveness, and quantity of herbicide needed.

2.2.2.5 Alternative F: Implement DFPZs, Group Selection, and Individual Tree Selection as in the Proposed Action, except Group Selection Would Not Occur in Watersheds over the Threshold of Concern; Maintain DFPZs with Herbicides; and Control Noxious Weeds with Herbicides

Alternative F proposes the same DFPZ construction, individual tree selection, road work, and aquatic and wildlife habitat improvement activities as alternative B. It also includes the use of the herbicide imazapyr to control brush regrowth on 1,954 acres of DFPZs and the herbicide triclopyr in combination with other tactics to control noxious weeds on 33 acres (see figure A-1 in appendix A for the location of the treatment units). Selection of this alternative would determine if brush regrowth in the Slapjack Project DFPZs would be treated in the short term (two to three years after construction). This alternative does not prescribe specific treatment methods for the long-term maintenance of the DFPZs.

Unlike alternative B, this alternative would implement approximately 190 acres of group selection harvest, instead of 219 acres, because units located in watersheds predicted to be over the Threshold of Concern were dropped. Acres of individual tree selection units were not affected because no units are proposed in watersheds predicted to be over the Threshold of Concern.

Alternative F addresses the concern that implementing ground-disturbing activities in watersheds that are approaching or over the Threshold of Concern would increase the risk of adverse effects and cumulative watershed effects. The Equivalent Roaded Area values serve as the indicator for this alternative.

2.2.2.6 Alternative G: Implement DFPZs, Group Selection, and Individual Tree Selection as in the Proposed Action, except Group Selection Would Not Occur in Watersheds over the Threshold of Concern; Maintain DFPZs without Herbicides; and Control Noxious Weeds without Herbicides

Alternative G proposes the same DFPZ construction, individual tree selection, road work, and aquatic and wildlife habitat improvement activities as alternative B. Alternative G was developed to address watershed concerns, much like alternative F. Alternative G would implement approximately 190 acres of group selection harvest, instead of 219, because units located in watersheds predicted to

be over the Threshold of Concern were dropped. Acres of individual tree selection units were not affected because no units are proposed in watersheds predicted to be over the Threshold of Concern.

Alternative G does not propose the use of herbicides to control noxious weeds or the regrowth of brush on 1,954 acres of the DFPZ. Noxious weeds would instead be controlled on 33 acres in the project area using a variety of methods, including backpack torches and hand pulling.

Alternative G does not propose specific treatments for the future maintenance of DFPZs. Decisions regarding long-term DFPZ maintenance—including the specific treatments to be used—would be made when the time for maintenance of the natural stands is reached (approximately 10–20 years after initial treatment). Therefore, herbicide use for preventive maintenance of the DFPZs is essentially precluded under this alternative because herbicides have been shown to be most efficient and effective in delaying or preventing the buildup of understory fuels when used within approximately two years of the initial treatment (HFQLG FSEIS, page 22).

Alternative G addresses the concern that implementing ground-disturbing activities in watersheds that are approaching or over the Threshold of Concern would increase the risk of cumulative watershed effects. It also addresses the concern that using herbicides to control noxious weeds and to maintain DFPZs would result in adverse effects on humans and the environment. The indicators include cost of treatments, effectiveness, quantity of herbicide needed, and Equivalent Roaded Area values.

2.3 Alternatives Considered but Eliminated from Detailed Study

The CEQ regulations require federal agencies to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and resolving the need for action. Several alternatives suggested by the public that did not meet the purpose and need for the project are summarized below.

2.3.1 Use of Alternative Herbicides

Imazapyr banned in Norway – Some public comments expressed concern about the use of imazapyr. The public comments stated that “Imazapyr has been identified by the Pesticide Action Network as being a dangerous chemical because of the risk of groundwater contamination and acute human toxicity.” In addition, “Imazapyr was denied re-registration in Norway due to unacceptable risk for ground water contamination, caused by high mobility and persistence in soil.”

The formulation of imazapyr that was banned in Norway was Arsenal 250 (Chemical Abstract Service [CAS] number 81334-34-1). The formulation of imazapyr that was listed by the Pesticide Action Network as being a dangerous chemical is the pure or parent formulation of imazapyr (CAS 81334-34-1). The isopropylamine salt of imazapyr (CAS number 81510-83-0) is not listed by the Pesticide Action Network.

Another consideration for banning certain pesticides in Norway is the low degradation of pesticides under Norwegian climatic conditions and soil types. The Slapjack Project proposes to use a different formulation of imazapyr (Arsenal AC) with a CAS number of 81510-83-0. This form of imazapyr is the isopropylamine salt of imazapyr, which has no Pesticide Action Network listing. The California Department of Pesticide Regulation has taken California's' unique climatic conditions into account in the registration of imazapyr (Arsenal AC) for use in California. See the "State Requirements" section (3.7.1.3) under "Regulatory Framework" (3.7.1) in the "Human Health and Safety" section of chapter 3 regarding pesticide registration in California.

Organic herbicides – Some public comments suggest that the Plumas National Forest should evaluate the use of nontoxic organic herbicides and other weed-control methods used by organic farming practices. For example, St. Gabriel Laboratories produces an organic herbicide called "BurnOut," which is not registered for forestry use by the California Department of Pesticide Regulation. In addition, some organic herbicides may be more toxic to humans than some of the synthesized herbicides. The signal word that appears on labels signifies how acutely toxic the pesticide is and what toxicity category it belongs to. The signal word for Arsenal AC (Imazapyr) is "Caution," which indicates low toxicity. The signal word for BurnOut is "Danger," which indicates that the pesticide is extremely toxic.

The Material Data Safety Sheet lists a number of health hazards for BurnOut, which contains acetic acid and is flammable and extremely corrosive. Contact with this product will result in severe eye irritation and possible permanent damage. Contact with this product will cause severe skin irritation and/or chemical burns. Breathing vapors will cause significant respiratory irritation and pulmonary edema with prolonged exposure. Ingestion of this product could cause burns and destroy tissue in the mouth, throat, and digestive tract.

Corn meal gluten – Some public comments suggested using corn meal gluten as an herbicide. Corn gluten inhibits germination of herbaceous plants and would not be effective on woody plants, shrubs, or hardwoods (tanoak) that exist in the Slapjack Project area. The Cottonwood Fire Vegetation Management final EIS (2005) also considered using corn gluten as an herbicide but determined it to be an ineffective treatment.

2.3.2 Alternative with 50 Percent Canopy Cover Retention and a Removal Limit of 20 Inches DBH and Below

An alternative was proposed that DFPZs in CWHR size class 4 and 5 stands be thinned to a 50 percent canopy cover with a maximum harvest limit of 20 inches dbh. This alternative was analyzed in both the Watdog Project on the Feather River Ranger District and the Empire Project on the Mount Hough Ranger District. In both analyses, it was shown that this alternative would neither meet the purpose of the project nor resolve the need for the project. The alternative would not fully implement fuel treatments to be tested under the HFGLQ Pilot Project. The analysis indicated a higher probability of crown fire, reduced economic contribution. Furthermore, these analyses indicated that there is little difference in adverse environmental effects, at a landscape or project area level, in treating stands to 40 percent canopy with a dbh limit of 30 inches versus treating stands to achieve a 50 percent residual canopy cover with a dbh limit of 20 inches. Therefore, this alternative was not analyzed in detail for the Slapjack Project.

2.3.3 Alternative That Considers Different Treatments in DFPZs to Address Watershed Effects

During the scoping period, a commenter suggested implementing different treatments in the DFPZ units in order to reduce ground disturbance and address cumulative watershed effects. However, non-mechanical treatments, such as underburning, may not adequately treat ground fuels, ladder fuels, reduce biomass, or meet the desired conditions described in “Appendix J: Fire and Fuels” in the HFQLG final EIS without a preliminary treatment such as mastication or harvest. Mortality of residual trees after an underburn would also be expected to increase. In dense stand conditions, such as those found in many Slapjack treatment units, underburning without pre-treatment could increase mortality of large, residual, fire-resilient trees. Underburning prescriptions establish specific weather conditions that need to be adhered to in order for burning to occur (the “burn window”). The burn window varies from year to year and limits the amount of underburning that can be prescribed and achieved. In addition, Air Quality Management Districts enforce standards that limit the amount of burning that can take place at any given time.

2.3.4 Alternative Consistent with the 2001 Sierra Nevada Forest Plan Amendment (SNFPA)

During the scoping process, one commenter suggested analyzing an alternative that fully implements the 2001 SNFPA Record of Decision. In 2004, the Record of Decision for the SNFPA final supplemental EIS was signed, and the Lassen and Plumas National Forests and the Sierraville Ranger District of the Tahoe National Forest were directed to implement the HFQLG Pilot Project, consistent with the HFQLG Act and alternative 2 of the HFQLG EIS (SNFPA Record of Decision, page 66). Because the Plumas National Forest does not follow the direction in the 2001 SNFPA Record of Decision, the 2001 SNFPA alternative suggested by the public was eliminated from detailed study as it would be outside the scope of the proposed action and would fail to meet current laws, rules, and regulations. Additionally, an alternative very similar to the 2001 SNFPA ROD in terms of diameter limit (20 inches) and canopy cover limit (50 percent) was analyzed for the Watdog Project. See section 2.3.2 for more information.

2.3.5 Alternative That Reduces Canopy Cover to 30 Percent in Treatment Units within the Wildland Urban Interface

Forest Service personnel considered an alternative that would reduce canopy cover to 30 percent in treatment units in the Wildland Urban Interface surrounding communities in the Slapjack Project area. Like the DFPZ prescriptions for all action alternatives, treatments would be designed to thin from below to remove ladder fuels and crown or canopy fuels to increase ground-to-crown height, spacing between trees, and spacing between tree crowns, and to use group selection to create size and structure diversity.

Treatment of DFPZs should result in a fairly open stand, dominated by larger, fire-tolerant tree species. Post-treatment canopy cover generally should not exceed 40 percent, although adjustments in stand density based on local conditions may be appropriate (Weatherspoon and Skinner 1996). Generally, in DFPZs adjacent to gentle to moderate slopes, 40 percent canopy cover provides

adequate crown separation to prevent active crown fires from carrying through the DFPZ in 90th percentile weather conditions.

However, in especially steep terrain, fires act to “pre-heat” the canopies of the trees upslope, causing the fire to transition to the tree crowns as it moves up the slope. In these situations, reducing crown separation below 40 percent on the ridge top will cause the crown fire to transition to a surface fire more quickly than in stands with higher canopy cover. Because of the gentle to moderate slopes that dominate the Slapjack Project area, reducing canopy cover below 40 percent is not warranted for the Slapjack DFPZs.

Chapter 3: Affected Environment and Environmental Consequences

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Chapter 3. Affected Environment and Environmental Consequences

3.1 Introduction

This chapter summarizes the physical, biological, social, and economic environments of the Slapjack Project area and the effects on that environment that would result from implementation of any of the alternatives. This chapter also presents the scientific and analytical basis for comparison of the alternatives presented in "Chapter 2: Alternatives."

Each resource section in this chapter provides a summary of the project-specific reports, assessments, and input prepared by Forest Service specialists, which are incorporated by reference in this draft environmental impact statement (EIS). The following reports and memoranda are incorporated by reference: Botanical Biological Evaluation, Botany Report, and Noxious Weed Risk Assessment; Biological Assessment / Biological Evaluation (BA/BE) for Fish and Wildlife; Hydrology Report; Silviculture Report; Soils Report; Fire and Fuels Report; Recreation, Visuals, Lands, and Minerals Report; and the Heritage Resources Report. These reports or memoranda are part of the project record on file at the Feather River Ranger District in Oroville, California. Copies on compact disc have been distributed with this EIS. Printed copies are available upon request by contacting Susan Joyce, Project Leader, at (530) 532-7437.

3.1.1 Scope of Analysis

The "Affected Environment" section under each resource topic describes the existing, or baseline, condition against which environmental effects were evaluated and from which progress toward the desired condition can be measured. Environmental consequences form the scientific and analytical basis for comparison of alternatives, including the proposed action, through compliance with standards set forth in the 1988 *Plumas National Forest Land and Resource Management Plan* (also referred to as the "Forest Plan"), as amended, and a summary of monitoring required by the *National Environmental Policy Act of 1969* (NEPA) and *National Forest Management Act of 1976* (see appendix G of this EIS for the findings). The environmental consequences discussion centers on direct, indirect, and cumulative effects, along with applicable mitigation measures. Effects can be neutral, beneficial, or adverse. The "Irreversible and Irretrievable Commitments of Resources" section is located at the end of this chapter. These terms are defined as follows:

- **Direct effects** are caused by the action and occur at the same place and time as the action.
- **Indirect effects** are caused by the action and are later in time, or further removed in distance, but are still reasonably foreseeable.
- **Cumulative effects** are those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

- **Irreversible commitments of resources** are permanent or essentially permanent resource use or losses. They cannot be reversed, except in the extreme long term. Examples include mineral extraction or loss of soil productivity.

- **Irretrievable commitments of resources** are losses of productivity or use for a period of time. One example is road construction on suitable timber lands. Timber growth on the land is irretrievably lost while the land is used as a road, but the timber resource is not irreversibly lost because the land could grow trees again in the near future.

3.1.2 Description of Alternatives

The following are brief descriptions of the seven alternative management scenarios analyzed for this proposal.

- **Alternative A** (the no-action alternative) addresses the NEPA requirement to analyze a no-action alternative and the potential effects of taking no action.

- **Alternative B** (the proposed action) calls for approximately 4,400 acres of Defensible Fuel Profile Zone (DFPZ) construction, 219 acres of group selection, and 148 acres of individual tree selection; transportation system improvements; and wildlife, aquatic, and riparian ecosystem restoration. This alternative includes the use of herbicides for preventive maintenance of DFPZs (1,954 acres) and as a tactic to control noxious weeds on a maximum of 31 of the 33 total acres analyzed for weed management.

- **Alternative C** proposes the same suite of actions as alternative B; however, herbicides would not be used for preventive maintenance of DFPZs nor would they be used to control noxious weeds.

- **Alternative D** (Forest Service preferred alternative) would implement DFPZs, group selection, and individual tree selection; transportation system improvements; and wildlife, aquatic, and riparian ecosystem restoration as described under alternative B. Herbicides would not be used for preventive maintenance of DFPZs, but herbicides would be used as a tactic to control noxious weeds.

- **Alternative E** would implement DFPZs, group selection, and individual tree selection; transportation system improvements; and wildlife, aquatic, and riparian ecosystem restoration as described under alternative B. Herbicides would be used for DFPZ maintenance, but they would not be used to control noxious weeds.

- **Alternative F** would implement DFPZs and individual tree selection; transportation system improvements; and wildlife, aquatic, and riparian ecosystem restoration as described under alternative B. However, this alternative calls for 190 acres of group selection, instead of 219 acres, because group selections located in watersheds predicted to be over the Threshold of Concern (TOC) have been dropped. This alternative includes the use of herbicides for preventive maintenance of DFPZs and as a tactic to control noxious weeds.

- **Alternative G** would implement DFPZs and individual tree selection; transportation system improvements; and wildlife, aquatic, and riparian ecosystem restoration as described under alternative B. Like alternative F, this alternative calls for 190 acres of group selection because groups located in watersheds predicted to be over the TOC have been dropped. Herbicides would not be used for preventive maintenance of DFPZs nor would they be used to control noxious weeds.

3.1.3 Cumulative Effects Analysis

The cumulative effects analysis area varies for each resource. Past activities are considered part of the existing condition and are discussed in the “Affected Environment (Existing Conditions)” and “Environmental Consequences” section under each resource. Figure A-5 in appendix A depicts the DFPZ projects on the Feather River Ranger District that are in progress, planned, or proposed. The analysis of cumulative effects is consistent with the direction provided in the Council on Environmental Quality's (CEQ) June 24, 2005, memorandum titled, “Guidance on the Consideration of Past Actions in Cumulative Effects Analysis.” In the memorandum, the CEQ provides guidance on the extent to which federal agencies are required to analyze the environmental effects of past actions when they describe the cumulative environmental effects of a proposed action in accordance with Section 102 of the NEPA and the CEQ regulations for implementing the procedural provisions of NEPA, 40 CFR parts 1500-1508. The CEQ memorandum is hereby incorporated by reference.

3.2 Air Quality

3.2.1 Introduction

Prescribed fire is one of the primary activities proposed for the Slapjack Project that would have a direct impact on air quality. Underburning would be conducted during fall, spring, or winter—the most favorable times in terms of smoke dispersion. A secondary source of impacts on air quality would be from dust and internal combustion engine emissions during project harvest and mastication activities.

3.2.2 Regulatory Framework

Air quality is managed through a complex series of federal, state, and local laws and regulations. The U.S. Environmental Protection Agency (EPA) has the primary federal role of ensuring compliance with the requirements of the *Clean Air Act*. The EPA issues national air quality regulations, approves and oversees State Implementation Plans, and conducts major enforcement actions. State and local Air Pollution Control Districts and Air Quality Management Districts (AQMDs) have the primary responsibility of carrying out the development and execution of State Implementation Plans, which provide for the attainment and maintenance of air quality standards.

The original *Air Quality Act* was passed in 1963. This act was followed by the *Clean Air Act* and its amendments of 1970, 1977, and 1990. The *Clean Air Act* is the primary legal instrument for air resource management. It requires the EPA to identify pollutants that have adverse effects on public health and welfare and to establish air quality standards for each pollutant. The EPA has issued National Ambient Air Quality Standards for sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter (PM) that is 10 microns (PM_{10}) in diameter or smaller. If the National Ambient Air Quality Standards are violated in an area, that area is designated as "nonattainment" for that pollutant, and the state must develop a plan for bringing that area back into "attainment." Title 17 of the California Air Pollution Control Laws sets similar standards for these pollutants.

The 1977 *Clean Air Act* amendments set up a process to designate Class I and Class II areas for air quality management. Class I areas receive the highest levels of protection under the Prevention of Significant Deterioration program, which regulates air quality through application of criteria for specific pollutants and use of the Best Available Control Methods. Class I areas include international parks, national parks larger than 6,000 acres, and national wilderness areas larger than 5,000 acres.

The 1990 amendment of the *Clean Air Act* published the General Conformity Determination. It states that in federal nonattainment areas, before actions can be taken on federal lands that have the potential to emit pollutants to the atmosphere, a determination must be made that the emissions will not exceed a *de minimis* (threshold) level measured in tons per year. If the action exceeds the *de minimis* level, then a conformity determination is required to document how the federal action will not (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. If the project emissions are below *de minimis* levels, the project would be considered exempt from conformity determination with the State Implementation Plan. Activities that affect air quality in

the project area are (1) prescribed burning on National Forest lands for reforestation, hazard reduction, and wildlife habitat improvement; (2) dust from construction and use of unpaved roads and harvest activities; and (3) wildfire occurrence.

On the Plumas National Forest, the 1988 *Plumas National Forest Land and Resource Management Plan* (also referred to as the "Forest Plan," page 4-46), the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS, and the 1999 HFQLG Act final EIS provide direction for coordination and cooperation with local Air Quality Management Districts.

The following operating procedures are from the HFQLG Act final EIS (1999) and the SNFPA final EIS (2004):

1. Mitigate dust from project activities by including standard dust abatement requirements in sale and project contracts.

2. Conduct prescribed burns when favorable smoke dispersal is forecasted, especially near sensitive Class I areas.

3. Use appropriate smoke modeling software to predict smoke dispersion.

4. Minimize smoke emissions by following Best Available Control Methods.

5. Avoid burning on high visitor use days and notify the public before burning.

6. Consider alternatives to burning.

7. Incorporate burn plan data into appropriate modeling software.

8. Comply with Title 17 of the 2004 California Air Pollution Control Laws and interim air quality policy and local smoke management programs.

9. Follow the Memorandum of Understanding on prescribe burning with the California Air Resources Board and the USDA Forest Service, Pacific Southwest Region.

3.2.3 Methodology for Assessing Impacts on Air Quality

3.2.3.1 Scope of the Analysis

The analysis for the Slapjack Project uses one indicator for air quality: criteria pollutant totals required for compliance with federal, state, and local laws and regulations. The analysis also discloses the effects of herbicide use on air quality.

The analysis area for air quality is the area potentially affected by smoke emissions, fugitive dust, and emissions from proposed treatments. This includes the project area and the air basins in which the project area is located. The project area lies entirely within the Sacramento Valley air basin (see figure 3-1). This air basin is administered by local Air Quality Management Districts with oversight regulation by the California Air Resources Board (CARB) (see figure 3-2). The Slapjack Project is located in the Butte County and Feather River Air Quality Management Districts.

Source: California Air Resources Board, http://www.arb.ca.gov/maps/abasibw.pdf

Figure 3-1. California Air Basins and Counties.

Source: California Air Resources Board, http://www.arb.ca.gov/maps/adistbw.pdf

Figure 3-2. California Air Quality Management Districts and Counties.

The air quality analysis for activities associated with each alternative includes identification of adjacent and downwind air basins of concern (class one and nonattainment areas), comparison of the amount of smoke and particulate matter to be produced as a result of fuels treatment and other project activities in DFPZ and group selection units, and a discussion of the consequences of wildfire produced emissions compared to prescriptive fire.

3.2.3.2 Analysis Methods and Assumptions

The predicted emissions from prescribed burning and harvest emissions in the proposed project area have been estimated using emission factors from EPA Document 42 and are based on an estimated 90 percent consumption of machine and hand piles and 85 percent of surface fuels for underburning. Underburning would be done over a period of five years; the amount of particulates is based on approximately 500 acres burned annually. The prescribed fire would be done in the spring, fall, or winter months because these are the best times of year for dispersion. Each year the burning would take place over a period of months, with treated areas spread throughout the project area.

The following are the assumptions used for determining emissions from timber operations and prescribed burns:

1. The emission factors used to determine effects from the project were taken from EPA Document 42 (EPA 1995) for prescribed burning, and from the *National Environmental Policy Act Air Quality Desk Reference Guide* (CH2M Hill 1995; table 3.3.2-1 for timber harvest operations).

2. All harvest thinning equipment will be diesel powered, and thinning treatments will occur over a five-year period.

3. Harvest operations include harvesting, processing, skidding, loading, hauling, and road watering.

4. Slash piles are constructed free of dirt, with 90 percent consumption.

5. The emissions from burning will result from burning approximately 500 acres annually on a five-year plan and would not be continuous (that is, separated by space and time).

6. There will be emissions from daily burning on approximately 100 acres. This would not be continuous but separated by seasons.

3.2.4 Existing Conditions

The Slapjack Project area is located in Butte and Yuba Counties, California, approximately 18 miles east of Marysville.

Butte and Yuba Counties are currently in federal nonattainment status for ozone, a product of volatile organic compounds or nitrogen oxides. There are no published emission factors that isolate ozone. Standards have been set, however, for the ozone precursors such as the volatile organic compounds and nitrogen oxides.

Air quality can be severely impacted by particulate matter and other pollutants during large wildfire events. Impacts from the 1992 Pendola fire on the Plumas and Tahoe National Forests affected air quality 60 miles away in Sacramento, California. Fugitive dust caused by construction and use of unpaved roads can produce PM_{10} in quantities great enough to impair the visual quality of the air. These effects are localized and can be mitigated by effective dust abatement methods. Dust generated by skidding, loading, and site preparation activities also contributes to fugitive dust; however, the level contributed by these activities is unknown.

3.2.4.1 Conformity Determination

As stated above, Yuba and Butte Counties are currently in federal nonattainment status for ozone (a product of volatile organic compounds or nitrogen oxides). The current allocation for volatile organic compounds or nitrogen oxides is 50 tons per year.

PM_{10} has been established as one of the six criteria pollutants because of adverse human health effects. The emission levels for PM_{10} are not mandated in the project area. Butte and Yuba Counties are currently in attainment for PM_{10}, and efforts to reduce PM_{10} would be implemented to prevent future health threats.

The activities that currently affect air quality in the project area are (1) prescribed burning on National Forest lands for hazard reduction; (2) dust from construction, use of unpaved roads, and harvest activities; and (3) wildfire occurrence.

Prescribed burning affects air quality in ways similar to wildfires, but prescribed burning offers many advantages over wildfire. This is because the effects of prescribed fire on air quality can be manipulated to reduce adverse effects. The Best Available Control Measures (BACM) are guidelines that have been developed to reduce the adverse effects of prescribed burns. The BACM are based on the “Prescribed Burning Background Document” and “Technical Information Document for Prescribed Burning Best Available Control Measures” (EPA 1992a, 1992b). The BACM are based on avoidance, dilution, and emission reduction strategies. Smoke mitigation techniques include consideration of atmospheric conditions, season of burn, fuel and duff moisture, daily wind shifts, appropriate ignition techniques, and rapid mop-up. Following these BACM, and identifying them in burn plans, is critical in preventing adverse air quality effects.

3.2.5 Environmental Consequences

3.2.5.1 Alternative A (No Action)

Direct and Indirect Effects. Under this alternative, no increase in ozone precursors or PM_{10} emission levels would be produced from prescribed burning of activity-generated fuels, harvest operations, or understory burning. Alternative A would not result in a reduction of surface fuels, so the potential for substantial degradation of air quality from future wildfire would not be reduced. The no-action alternative would not provide any opportunities for reducing existing forest fuels and the hazard they pose in wildland fires. During the flaming phase of a catastrophic wildfire, air quality degradation can exceed federal and state standards as far as 60 miles downwind. Wildfire usually occurs under very stable atmospheric conditions, which tend to disperse smoke; consequently, this can not be regulated by local Air Quality Management Districts. The potential ozone precursors from a wildfire are shown in table 3-1.

Table 3-1. Potential ozone precursors and PM_{10} from wildfire emissions.

Nitrogen Oxides	Volatile Organic Compounds	Particulate Matter (PM_{10})
82 tons	1,531 tons	1,307 tons

Cumulative Effects. Under alternative A, the project area would be subjected to long-term deposition of surface fuels. Forest fuels would continue to increase with biomass production and would out-produce the decomposition rates in this climate. The long-term chronic effects of wildfires would be higher PM_{10} emissions, mostly due to large areas of exposed soil and ash in the aftermath of a high-intensity wildfire.

3.2.5.2 All Action Alternatives

Direct Effects. Two methods of prescribed burning would be used to accomplish fuel load reduction: underburning and pile burning (piles created by machine and by hand). Underburning would be used to reduce both natural and activity-generated fuels where it is not cost effective or physically practical to pile and burn. The objective of underburning would be to reduce fuel loadings while protecting the residual overstory trees from damage caused by heat and flames or damage from equipment. Pile burning would produce less particulate matter per acre than underburning because piled material can be ignited with lower fuel moistures, which ensures complete and efficient consumption

The release of particulate matter into the air during prescribed burning can have adverse effects on visibility and public health. As described above, the volume of particulate matter is related to which burning method is used and the extent of the burning. Particulate concentrations in the Sacramento Valley air basin (see figure 3-1 above) are influenced by climatic conditions and other emission-generating activities carried out in the air basin. Particulate concentrations are regulated through compliance with the California Air Resources Board and local Air Quality Management Districts.

The prescribed burning proposed in all action alternatives would be used to reduce fuel loadings to an acceptable level. Under favorable smoke-dispersal conditions, the smoke would likely affect air quality during ignition and for approximately three days following ignition. Another impact of all action alternatives would be the emissions and dust caused by project activities. Emissions from burning and equipment used for other project activities (such as thinning and mastication) may be occurring at the same time, which would elevate particulate matter. By following the burn plan and Air Quality Management District requirements for burning and managing other project activities, it is unlikely that emissions caused by the project would exceed California Air Quality Standards for the two Air Quality Management Districts. By implementing prescribed burning for the Slapjack Project at 500 acres or less annually, the particulates from prescribed burning would not exceed the *de minimis* threshold values, thus the project would meet conformity.

The prescribed fire proposed for the Slapjack Project would produce a total of 28.36 tons of volatile organic compounds (VOC), 10.0 tons of nitrogen oxides (NO_x), and 64.68 tons of PM_{10} annually (see table 3-2). The annual criteria pollutant totals for timber operations (emissions from trucks and other equipment) would vary according to the acres of treatments performed each year (table 3-3). Table 3-4 presents the total criteria pollutants for prescribed burning and timber operations. *De minimis* levels for VOC and NO_x are 50 tons per year. As shown, the emission levels for VOC and NO_x are below the *de minimis* levels. Therefore, the Slapjack Project is exempt from conformity determination. Emission levels are not mandated in the project area because Butte and Yuba Counties are in attainment for PM_{10}.

Table 3-2. Annual criteria pollutant totals (prescribed burning [approximately 500 acres annually]).

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	10.0	28.36	64.68
2	10.0	28.36	64.68
3	10.0	28.36	64.68
4	10.0	28.36	64.68
5	10.0	28.36	64.68

Table 3-3. Criteria pollutant totals, timber operations.

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	7.1	.40	.40
2	7.1	.40	.40
3	4.7	.20	.31
4	4.7	.20	.31
5	2.3	.10	.15

Table 3-4. Annual criteria pollutant totals for timber operations and prescribed burning combined.

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	17.1	28.76	65.08
2	17.1	28.76	65.08
3	14.7	28.56	64.99
4	14.7	28.56	64.99
5	12.3	28.46	64.83

Table 3.5 is a comparison of the conformity determination and shows estimated emissions from the burning in the project area that would be done on a daily basis, at any given time. The assumption is that no more than 100 acres would be burned on any given day; this is based on previous burning experience on the Feather River Ranger District.

Table 3-5. Daily criteria pollutant total (prescribed burning [approximately 100 acres daily]).

Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
Tons		
2.0	5.67	12.94

Indirect Effects. In the event of a wildfire, the stands in the Slapjack Project area that were treated by mastication, pile burning, or underburning would produce less particulate matter emissions than untreated areas outside the project area.

Cumulative Effects. The VOC, NO_x, and PM_{10} emissions from all action alternatives would contribute to particulate matter loading locally and regionally. Local effects include cumulative emissions from prescribed burning resulting from past practices, natural surface fuel buildup, and activities on federal, state, and private lands near the Slapjack Project area. The PM_{10} atmospheric concentrations currently do not exceed national standards; however, emissions could exceed CARB standards if (1) weather conditions predicted by CARB meteorologists do not prevail, or (2) emissions do not disperse as predicted, and/or (3) emissions from other Air Quality Management Districts adversely impact air quality in local districts. Forest Service and CARB smoke-dispersal forecasting would be used as part of the burn plan to mitigate effects within the regulatory framework.

3.2.5.3 Alternative A (No Action): Effects on Air Quality from Herbicide Use

Direct, Indirect, and Cumulative Effects. Herbicides would not be used for DFPZ preventive maintenance or noxious weed control; therefore, no direct, indirect, or cumulative effects on air quality related to herbicide use would occur.

3.2.5.4 All Action Alternatives

Direct Effects. The effects of alternatives B, E, and F are combined for this section because they propose the use of herbicides for preventive maintenance of DFPZs, and the effects on air quality would be very similar. No direct effects on air quality due to herbicide use are expected because herbicides are not proposed for units with prescribed burn treatments. Alternatives C, D, and G do not propose herbicide use for DFPZ preventive maintenance. Therefore, no direct effects are expected. Alternative D, however, does propose the use of herbicides to control noxious weeds on a maximum of 31 acres outside of DFPZs, and herbicides would likely be used as a follow-up treatment if underburning does not effectively control the noxious weeds. Herbicide use may precede prescribed burning in some units that cannot be burnt in the first year or two of treatments.

Indirect Effects. An indirect effect of herbicide use in alternatives B, E, and F, compared to alternatives C, D, and G, would be fewer emissions in subsequent follow-up and maintenance underburns due to biomass reduction in shrubs in areas where herbicides would be used to treat tanoak and brush for preventive maintenance of DFPZs, as well as to control noxious weeds on up to 31 acres in the project area. There would also be less risk of escape from lofted embers from torching shrubs and less risk of mortality in residual trees from burning shrubs in follow-up and maintenance underburns.

In alternatives C, D, and G, the follow-up or maintenance underburn in units without prior herbicide treatments would produce more emissions from burning live biomass (shrubs). There would also be an increased risk of escape from lofted embers from torching shrubs and increased risk of mortality in residual trees.

3.2.6 Past, Present, and Reasonably Foreseeable Future Actions

Past prescribed burning projects in and around the Slapjack Project area would have no effect on current air quality because of the temporal effects of dead and live biomass combustion. There are no other prescribed burning projects planned on the Plumas National Forest that would be occurring during implementation of the Slapjack Project. The local Air Quality Management Districts would also regulate prescribed burning on private property and on other National Forest System lands that are close enough to impact and/or worsen emissions in the two Air Basins during Slapjack Project implementation. Any cumulative effects from burning in the Slapjack Project area would be temporary and, when performed in accordance with Air Quality Management District regulations, would not violate any air quality standards.

3.2.7 Summary of Cumulative Effects

Without considering the possibility of future wildfires, the no-action alternative would have no cumulative effects on particulate matter and visibility. The action alternatives would have cumulative effects on air quality in the project area and local air basin (Sacramento Valley), but the effects would be managed to be within the regulatory standards of the California Air Resources Board. The dust and emissions from project activities would be mitigated by requiring that standard operating procedures be included with timber sale or service contract packages.

3.3 Botanical Resources and Noxious Weeds

3.3.1 Introduction

Forest Service Manual 2672.42 specifies that a biological evaluation (BE) must be prepared to determine if a project may affect any Forest Service Sensitive species, and a biological assessment (BA) must be prepared to address effects on U.S. Fish and Wildlife Service (USFWS) Threatened, Endangered, or Proposed species. The purpose of this section is to describe the effects of the proposed project on all Threatened, Endangered, Proposed, and Sensitive plant species of record for the Slapjack Project area. These species will be collectively referred to as "rare" species. The objectives of the BA/BE are to

- ensure that Forest Service actions do not contribute to loss of viability of any native or desired nonnative plant or animal species;
- ensure that Forest Service actions do not hasten the federal listing of any species; and
- provide a process and standard through which rare species receive full consideration throughout the planning process, reducing negative impacts to species and enhancing opportunities for mitigation.

This "Botanical Resources and Noxious Weeds" section presents a summary of the results of the BA/BE for botanical resources, which is on file at the Feather River Ranger District office in Oroville, California. The BA/BE includes a complete discussion of (1) USFWS Threatened, Endangered, and Proposed species and Forest Service Region 5 Sensitive species with potential habitat in the project area; (2) project effects on Plumas National Forest Special Interest species ("Appendix A: Botany Report" in the BA/BE); and (3) noxious species ("Appendix C: Noxious Weed Risk Assessment" in the BA/BE).

Floristic botanical surveys were conducted in proposed treatment units in 2002, 2003, and 2004 for U.S. Fish and Wildlife Service Threatened, Endangered, Proposed, and Sensitive species; Forest Service Region 5 Sensitive species; and Plumas National Forest Special Interest species. Also, unique habitats and noxious weeds were surveyed by Forest Service botany staff and Ecosystems West Consulting. Nonvascular plant surveys were conducted by Colin Dillingham in 2004. Fungi surveys were conducted in 2004 by Forest Service botany staff. Roadside noxious weed surveys were conducted in 2002 and 2003 (see "Appendix C: Noxious Weed Risk Assessment" of the Botany BA/BE). All surveys were conducted at the appropriate time of the year to identify rare species. Management Indicator Species (MIS) are identified in the 1988 *Plumas National Forest Land Resource Management Plan*. The MIS on the Plumas National Forest are also Sensitive plant species. Consequently, any discussion of Sensitive or rare species includes MIS.

Approximately 77 percent of this area is private land with a high degree of commercial timber production. The Threatened plant, Layne's butterweed (*Senecio layneae*), occurs on approximately 13.7 acres in the analysis area, of which 0.3 acre is located in a potential underburn unit. There are an additional 478 acres of rare plants in the analysis area, of which 37 acres are located in potential treatment units.

3.3.2 Regulatory Framework

3.3.2.1 Sensitive Species

The 1988 *Plumas National Forest Land and Resource Management Plan* (commonly referred to as the "Forest Plan"), as amended, provides forest-wide general direction to

- maintain viable populations of Sensitive plant species (page 4-34).

The Forest Plan also includes forestwide standards and guidelines to

- Protect Sensitive and Special Interest plant species as needed to maintain viability (page 4-34).
- Inventory and monitor Sensitive plant populations on a project-by-project basis (page 4-34).
- Develop species management guidelines to identify population goals and compatible management activities / prescriptions that will maintain viability (page 4-34).

3.3.2.2 Noxious Weed Management

The *Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement* (HFQLG Act final EIS) and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS amended the management direction in the Forest Plan to address management of noxious weeds and invasive exotic (nonnative) weeds. Management direction for noxious weed and invasive exotic weed management is found on page 2-9 of the HFQLG Act final EIS and page 36 of appendix A of the SNFPA Record of Decision. Table 2.4 of the HFQLG Act final EIS states:

> "D. Manage National Forest system lands so that management activities do not introduce or spread noxious or invasive exotic weeds using the following guidelines during site-specific planning and implementation:
>
> > Inventory: As part of site-specific planning, inventory project areas and adjacent areas (particularly access roads) for noxious and invasive exotic weeds.
> >
> > Control: If noxious weeds are found in or adjacent to a site-specific project area, evaluate treatment options relative to the risk of weed spread without treatment. Evaluate control methods at the site-specific planning level.
> >
> > Prevention/Cleaning: Require off-road equipment and vehicles (both Forest Service owned and contracted) used for project implementation to be weed-free. Clean equipment and vehicles of all attached mud, dirt and plant parts. Use standard timber sale contract clause C6.343-Cleaning of Equipment in timber sale contracts.

> Prevention/Road Construction: Require all earth-moving equipment, gravel, fill or other materials to be weed-free. Use onsite sand, gravel, rock or organic matter, where possible. Evaluate road locations for weed risk factors.
>
> Prevention/Revegetation: Use weed-free equipment, mulches, and seed sources. Avoid seeding in areas where revegetation will occur naturally, unless noxious weeds are a concern. Save topsoil from disturbance and put it back to use in onsite revegetation, unless contaminated with noxious weeds.
>
> Prevention/Staging Areas: Do not stage equipment, materials, or crews in noxious weed infested areas where there is risk of spread to areas of low infestation."

Appendix A of the SNFPA 2004 Record of Decision (page 36) establishes goals for noxious weed management using an integrated weed management approach according to the priority set forth in Forest Service Manual 2081.2:

- Priority 1 – Prevent the introduction of new invaders.
- Priority 2 – Conduct early treatment of new infestations.
- Priority 3 – Contain and control established infestations.

Provisions for implementing these goals are embodied in the noxious weed management standards and guidelines of the SNFPA 2004 Record of Decision.

3.3.3 Methodology for Assessing Impacts on Botanical Resources and Noxious Weeds

3.3.3.1 Scope of the Analysis

The geographic boundary of the analysis area for botanical resources consists of the level 6 subwatersheds surrounding the Slapjack Project area. These include McCabe Creek, Ponderosa Reservoir, New Bullard's Bar Reservoir, Frey Creek, Lower Dry Creek, and Dobbins Creek, totaling approximately 144,000 acres. The subwatersheds were selected as the analysis area due hydrologic connectivity and the potential for treatment effects on rare plant species to be magnified down stream. For example, herbicides applied in a watershed will express their effects within that same watershed or at some point downstream.

Time Frame. Determining the duration of effects requires estimating the length of time the effects of the proposed action and alternative could last. More specifically, this length of time would extend as long as the effects of the action alternatives are, singly or in combination with other anticipated effects, distinguishable from effects of the no-action alternative. In general, analysis should extend until the resource has recovered from the impact of the proposed action or any of the alternatives.

The additive effects of past actions (such as wildfire suppression, timber harvest, mining, nonnative plant introductions, and ranching) have shaped the present landscape and corresponding

populations of rare plants. It is impossible to quantify the effects of historic activities on rare plants because no records are available to describe what the "natural state" consisted of. Undoubtedly, some plant species have always been rare due to particular ecological requirements or geographic isolation. Past actions have made some common plants rarer and encouraged others to be more common. For example, fire suppression has encouraged the proliferation of shade-tolerant, fire-intolerant species, and as a result, environmental conditions necessary for general openings and phase species regeneration is missing, and these plant species are most likely rarer as a result.

3.3.3.2 Analysis Methods

The Slapjack Project area was reviewed using aerial photographs, soils maps, and known occurrences to help determine potential habitat for rare species. In the field, areas identified as potential habitat were surveyed at a high level of intensity (complete survey). Areas identified as potential habitat include openings in the forest, serpentine soils, meadows, riparian areas, seeps, and springs. Other areas with little to no potential habitat were surveyed at a less intense level (cursory survey). Plant location data were recorded using Global Positioning Systems, and the data were then entered into a Geographic Information System (GIS). Treatment units were added to the GIS to analyze proximity to rare species and identify potential detrimental treatments and designate "Controlled Areas." Areas of concern were brought forward at planning meetings, and necessary modifications were made to the project design. Past actions were summarized by decade starting in 1980.

3.3.4 Affected Environment (Existing Conditions)

The current landscape in the analysis area reflects a variety of past actions that include timber sales, mining operations, cattle grazing operations, and fire suppression. Highly effective mechanized fire suppression has changed the composition of the forests in this project area as well as much of the Northern Sierra Nevada. The open, fire-resilient forests have been replaced by dense stands of shade-tolerant species such as white fir. Botanical surveys reveal that these dense stands lack understory vegetation.

Approximately 77 percent of the analysis area is private land, with a high degree of commercial timber production. Federal lands in the area have very dense canopy cover. As described in table 2 of the Draft Challenge Landscape Assessment (2006), approximately 10 percent of the area is described as moderate stand density (40–59 percent canopy cover), and 84 percent of the area is described as dense (60–100 percent cover). Stand density is a consequence of fire suppression and a reflection of productive soils and high annual rainfall.

Table 3-6 lists the rare plant species that occur in the analysis area. These rare species would be protected by

- avoidance through flagging and signing in the field;
- imposing Limited Operating Periods to allow rare species to finish their life cycle; or
- changing the prescription (for example, conducting an underburn in the spring rather than the fall).

Table 3-6. Acres of rare plant species in the 144,490-acre botanical resources analysis area and proposed treatment units.

Common Name	Species	Guild[a]	Analysis Area (total acres)	Treatment Units (total acres)
Ahart's sulfur flower	*Eriogonum umbellatum* v. *ahartii*	Serpentine	0.5	0
Bacigalupi's yampa	*Perideridia bacigalupii*	Serpentine	0.3	0.1
Brandegee's clarkia	*Clarkia biloba* ssp. *brandegeae*	General openings	0.13	0
Brownish beaked-rush	*Rhynchospora capitellata*	Riparian forest	0.4	0
Butte County fritillary	*Fritillaria eastwoodiae*	Gap-phase	260	27
Clustered lady's slipper	*Cypripedium fasciculatum*	Interior forest / Riparian forest	0.13	0
Henderson's bent grass	*Agrostis hendersonii*	Riparian forest	0.1	0
Humboldt lily	*Lilium humboldtii* ssp. *humboldtii*	Gap-phase / General openings	19.1	8.1
Layne's butterweed	*Senecio layneae*	Serpentine	13.7	0.5
McNab cypress	*Cupressus macnabiana*	Serpentine	19	0
Mosquin's clarkia	*Clarkia mosquinii*	General openings	82	1
Northern Sierra rayless daisy	*Erigeron petrophilus* var. *sierrensis*	Serpentine	11	0.1
Sanborn's onion	*Allium sanbornii* var. *sanbornii*	Serpentine	1.3	0
Tall checker bloom	*Sidalcia gigantea* sp. *nova*	Riparian	0.02	0
Three-leaved beakseed	*Bulbostylis capillaris*	Riparian	0.2	0
Tooth wort	*Cardamine* sp. *nova*	Gap-phase	70	0.6
White-stemmed clarkia	*Clarkia gracilis* ssp. *albicaulis*	General openings	0.13	0
Round-leaved sundew	*Drosera rotundifolia*	Riparian forest	0.01	0

Note:

a. The species discussed in this analysis were grouped by guilds. The term “guild” is used to group species that use similar resources in a similar way. Plant species in the same guild are found in similar habitat types and have similar environmental requirements (HFQLG Act final supplemental EIS, 2004 Biological Evaluation, page 33). The guilds are described below.

In some cases, depending on the species and the management prescription, no protection would be given for disturbance-tolerant rare plant species. Specific recommendations for each occurrence are found in appendix B of the Botany Biological Evaluation (the “Botany Protection Plan”).

3.3.5 Environmental Consequences: General Effects

The general direct, indirect, and cumulative effects of project-related activities on rare plants are described below.

Direct Effects. Rare plants can be directly impacted when they are driven over, covered, have trees fall on them, or are burned. These actions can physically break, crush, or uproot the plants. These impacts on individual plants can reduce their growth and development population size, and potentially, the viability of the species across the landscape. The plants may also experience reduced or eliminated seed-set and reproduction. If the disturbance is severe, it can kill rare plants. For annual plant species, the timing of impacts is critical. Management actions that take place after annuals have set seed have much less impact than management actions performed prior to seed-set.

Indirect Effects. Indirect effects (both positive and negative) on rare plants may be caused by changes in vegetation composition, solar exposure, hydrologic patterns, fire regime, or soil characteristics of the habitat. Indirect effects can also occur from noxious weed invasion (see "Appendix C: Noxious Weed Risk Assessment" in the Slapjack Project BA/BE for Threatened, Endangered, and Sensitive Plant Species [2006]) or from impacts on pollinators or mycorrhizae associated with the various species.

Cumulative Effects. A cumulative effect results from the incremental effect of the action when added to the effects of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions and regardless of land ownership on which the other actions occur. An individual action when considered alone may not have a significant effect, but when its effects are considered in sum with the effects of other past, present, and reasonably foreseeable future actions, the effects may be significant (40 CFR 1508.7 and 1508.8 and FSH 1909.15 Section 15.1).

Alternative A (No Action)
- No treatments would be implemented.

Alternative B (Proposed Action)
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres), mechanical and manual methods, and prescribed burning

Alternative C
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Alternative D
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds with herbicides (up to 31 acres)

Alternative E
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds without herbicides

Alternative F
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres)

Alternative G
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Cumulative, direct, and indirect effects can be minimized by following Forest Service standards and guidelines and by implementing mitigation measures to monitor or offset impacts on rare plant species. With these protective measures in place, cumulative effects are less likely to be adverse. Current management direction is designed to eliminate or reduce possible negative cumulative

impacts by protecting sensitive plant species from direct and indirect impacts. The following discussion provides an explanation of why this type of management is effective in reducing cumulative impacts.

3.3.6 Affected Environment (Existing Conditions): Gap-phase and General-openings Guild Species

Gap-phase species are disturbance followers that do not respond well to major disturbances but do increase with infrequent, small-scale disturbance. These are matrix species (those not confined to separated or patchy habitats) that depend on periodic disturbance, followed by stable conditions. The disturbance event causes an increase in light reaching the ground and a gap in plant cover, which creates favorable conditions for new seedlings to grow. After the seedlings are established, stable conditions favor growth of the seedlings to maturity and reproductive status. Some forest edge species or species that occur under open canopies along artificial forest margins, such as stabilized roadsides and old skid trails, are included in the gap-phase guild.

There are approximately 349 acres of gap-phase species in the analysis area and approximately 35.7 acres in the proposed treatment units.

The general-openings guild contains opportunistic species that germinate or invade open areas. The openings may result from natural events such as landslides, avalanches, or windstorms, as well as from mechanical soil disturbance and opening of the canopy. Species in this guild also respond well to secondary fire effects, such as sunlight from canopy loss and bare soil from duff loss. Some forest-edge species or species that occur under open canopies along artificial forest margins, such as stabilized roadsides and old skid trails, are included in this guild. The primary threats to this guild are road use, construction, and maintenance; mechanical vegetation treatments; development; off-highway vehicle use; reforestation; lack of fire; stock trampling; mining; and prescribed burns in spring (2004 HFQLG final supplemental EIS B/BE pages 35–40). There are approximately 82 acres of general-openings guild species in the analysis area and 1 acre in a proposed treatment unit.

The following summarizes the rare species that are known to occur or have potential habitat in the analysis area. For each species, information is provided on abundance, global range / distribution, distribution in the analysis area, trend, fragility and habitat specificity. Data were obtained from the Forest Service Region 5 proposed (2005) Sensitive species list. Sensitive species with potential habitat in the analysis area were discussed in the Slapjack Project BA/BE.

Butte County fritillary (*Fritillaria eastwoodiae*)

Abundance

There are 75 known occurrences on the Plumas National Forest and 7 on the Tahoe National Forest. There are at least 2 locally known, though undocumented, occurrences on the Shasta-Trinity National Forest. It is also known to occur on private lands in the foothills. Some of the foothill occurrences have been obliterated with development. *Rarefind 2005* lists 101 occurrences. Despite this large number of occurrences, most are small and the individuals can be easily counted. On the Plumas National Forest, there are typically less than 10 flowering stalks in each occurrence, and the total number of sexually reproductive plants is very low. Tahoe National Forest occurrences number less than 20 plants to hundreds of plants.

Range/ Distribution

The known range of Butte County fritillary has historically been the counties of Shasta, Butte, Yuba, Nevada, Placer, and Tehama in five distinct stable population centers. There is also a single report of it occurring in Napa County. In the Sierra and Cascade foothills, it is known to occur from 360 to 4,320 feet in elevation. It is found on unprotected private land inholdings and National Forest System lands mostly within the boundaries of the Plumas National Forest. The range is roughly a 9-mile band on the western side of the Plumas National Forest in the Feather River Ranger District. Four of the seven Tahoe National Forest occurrences are clustered in an area that is less than a 1-mile radius (may be sub-occurrences). The northernmost populations are near Shasta Lake in the Shasta Lake Ranger District of the Shasta-Trinity National Forest. These are not documented in *Rarefind 2005*.

Within the Analysis Area

There are approximately 260 acres in the analysis area, with approximately 27 acres in proposed treatment units.

Trend

Some of the historical occurrences on the Plumas National Forest have not been relocated. This has happened either in areas where the tree canopy has been removed, or conversely, where the canopy has closed in and covered the ground with litter. Some of the plants on the Plumas National Forest are not reproducing. Plants are also not reproducing on the Tahoe National Forest. Quite often, the habitats where this plant is flowering are areas of moderate or light disturbance (such as old timber cuts). Plants that are found in habitat with heavier tree canopy or shrub cover are often not flowering (basal leaves only). It appears that plants need some canopy openings to maintain viability.

Fragility / Habitat Specificity — The habitat of this species is not particularly specific. It has been found on serpentine substrate (soil high in magnesium and low in calcium) and is sometimes associated with the guild of serpentine plants. However, it is not restricted to serpentine and has been found on a variety of volcanic and granitic soils. It is typically found on dry slopes in open canopied mixed conifer forest, or semi-shaded chaparral in foothill woodland. The main habitat indicator appears to be a partly open canopy with moderate litter.

Tooth wort (*Cardamine #3*)

Guild — Gap phase.

Abundance — On the Plumas National Forest, it is known to occur on the Feather River and Mount Hough Ranger Districts. There are approximately 100 acres of plants on the Feather River Ranger District.

Range/ Distribution — According to *Plumas County and Plumas National Forest Flora* (Clifton 2003), the plants with the marbled leaves with green and purple are found from Shasta County to Nevada County in deep woods. It has also been observed in semi-open stands of trees in skidder trails and fire lines. Plants under heavy canopy cover are typically not reproductive.

Within the Analysis Area — There are approximately 70 acres in the analysis area, with 0.6 acre in proposed treatment units.

Trend — Unknown.

Fragility / Habitat Specificity — It is found in openings in mixed conifer forest. This species has been found in areas that have had soil disturbance.

Humboldt lily (*Lilium humboldtii* ssp. *humboldtii*)

Guild — Gap phase / general openings.

Abundance — Surveys on the Feather River Ranger District in 2004 have identified several new occurrences. There are approximately 19 acres in the analysis area and 8 acres in proposed treatment units.

Range/ Distribution — It is known to occur on the southern Cascade Range in Tehema County to the Sierra Nevada in Fresno County.

Within the Analysis Area — There are approximately 19 acres in the analysis area, with 8 acres in proposed treatment units.

Trend — Unknown.

Fragility/ Habitat Specificity — It grows in dry wooded slopes and openings in ponderosa pine and oak woodlands. In 2004 it was observed in a 1- to 2-year-old clear cut north of Challenge, CA. Plants were growing vigorously, with many inflorescences (flowers), and were over 6 feet in height. Plants observed in heavily shaded areas do not flower.

Brandegee's clarkia (*Clarkia biloba* ssp. *brandegeae*)

Guild — General openings.

Abundance — The Tahoe National Forest has four occurrences (population numbers range from over 100 to over 10,000 plants) on National Forest System lands and an unknown number of occurrences on private lands within the forest boundary. The Plumas National Forest has two occurrences (occurrences contain hundreds of individuals each) on National Forest System lands and four occurrences on private lands within the forest boundary.

Range/ Distribution — This plant is known to occur in the counties of Butte, Placer, Yuba, El Dorado, and Nevada.

Within the Analysis Area — There are three recorded sites in the analysis area; two of these sites were not relocated with botanical surveys in 2004. The known site (about 0.13 acre) is located along a road and is approximately 0.5 mile from the nearest proposed treatment unit.

Trend — Unknown.

Fragility/ Habitat Specificity — This plant is found in low elevation openings in chaparral and cismontane woodlands (Skinner and Pavlik 1994). It is assigned to the gap-phase and general-openings guilds. Most occurrences are located on road cutbanks and may be vulnerable to road maintenance. These habitats are generally not part of the National Forest System.

Mosquin's clarkia (*Clarkia mosquinii*)

Guild — General openings.

Abundance — There are 33 known occurrences scattered throughout about 120 square miles; 25 of these are on the Plumas National Forest. Most reported occurrences include one to several small distinct sub-occurrences of this species.

Range/ Distribution — There is limited distribution of this plant in Butte and Plumas Counties. It often occurs in road cuts and on decomposing granite.

Within the Analysis Area — There are approximately 82 acres of Mosquin's clarkia in the analysis area, with 1 acre in proposed treatment units.

Trend	Occurrences appear to be stable over the few years since this species (until recently considered to be extinct) was rediscovered in 1992. Few new occurrences have been located since 1994. Two new extensions of populations were found in July of 2002.
Fragility/ Habitat Specificity	The species is probably a fire-follower. The type and intensity level of fire that this species favors has not been determined. Wildfire suppression has probably restricted its natural habitat, with roadsides becoming refugia.

3.3.7 Environmental Consequences: Effects of DFPZ Construction, Group Selection, and Individual Tree Selection Treatments on Gap-phase and General-openings Guild Species

The DFPZ treatments include mastication, under-burning, thinning, biomass removal, hand-cut pile burn, fire line construction, and road construction. These effects are examined in detail in the Slapjack Botany BA/BE.

3.3.7.1 Alternative A (No Action)

Direct Effects. There would be no direct effects on gap-phase and general-openings guild species.

Indirect Effects. There would be a gradual decline in the absence of disturbance and lack of fire. There would be an increased risk to catastrophic fire and subsequent noxious weed invasion.

Cumulative Effects. The cumulative effects discussion is at end of this section.

3.3.7.2 All Action Alternatives

There are approximately 28 acres of Butte County fritillary in proposed DFPZ and group selection units; 20 of these acres are in under-burn units. In group selection units, there is approximately 0.5 acre of Butte County fritillary, 1 acre of Humboldt lily, and 0.5 acre of tooth wort.

Direct Effects. Heavy equipment used for mastication, thinning, and biomass removal could destroy the above-ground parts of plants. These perennial plants may be negatively impacted if the above-ground parts are removed prior to seed set or if plants are uprooted. Rare plants could be killed during underburning and by road construction if the plants are located in the roadbed.

The timing of prescribed burns would be critical since annuals would not be affected by fall burns that take place after they have set seed, but they could be affected in the spring when they are growing and flowering. However, new research indicates that spring burns are often cooler and patchier than fall underburns. If prescribed burns are too hot, the impact on rare plant species could be greater because high-intensity fires could sterilize the soil, thereby killing the seed bank. Firelines and piles would be placed to avoid known occurrences of rare plants. Controlled areas for piles have been identified by unit (see appendix B of the Botany BA/BE in the project record) and would be designated in the field prior to pile construction.

Indirect Effects. The proposed transportation system improvements would create habitat and an avenue for dispersal of noxious weeds. Also, fireline construction, where bare mineral soil may be exposed, could create habitat for noxious weeds in the short term. To prevent the spread of noxious weeds, treatment units with known infestations would be designated for "hand lines" only, and no mechanical (bulldozer) lines would be constructed. Mastication and harvest equipment could also inadvertently introduce noxious weeds that would likely compete with native species. Areas of known infestations in proposed treatment units would be identified on project maps and on the ground as controlled areas where equipment would be excluded. Known noxious weed infestations would be buffered by 25 feet from the last plant to account for dispersal of seeds. These controlled areas would be treated with hand equipment. Also, units with known infestations are considered to be "infested," and equipment would be washed in that infested unit before it is moved to an uninfested unit. These mitigation measures would help prevent the spread of noxious weeds during DFPZ construction and timber removal.

If masticated fuels are burned as a follow-up treatment, rare plants may be killed and the soil sterilized as a result of high temperatures. The correlation between masticated fuel depth and soil heating was investigated by Busse et al. (2005); it was found that, "The potential for biological damage from soil heating during fire exists following mastication, particularly in dry soil with mulch depth of 7.5 cm [centimeters] or greater." This issue has been recognized and is addressed through the gathering of plot data that includes a measure of tons of biomass per acre. According to the Feather River Ranger District silviculturist (M. Mateyka, pers. comm. 2005), the cut-off between mastication and removal treatments is 14 tons/acre. Mastication may inadvertently introduce noxious weed species that would likely compete with native plant species. Mastication could reduce competition to resources such as light, water, and nutrients, resulting in an overall benefit to these species. On the Feather River Ranger District, Butte County fritillary has been shown to respond favorably to mastication treatment. Quite often, the habitats where this plant is flowering are areas of moderate or light disturbance, such as old timber cuts. Plants that are found in areas with heavier tree canopy or shrub cover are often not flowering (basal leaves only), so it appears that plants need some canopy openings to maintain viability. Road construction could create habitat and a dispersal avenue for noxious weeds.

Some shrubs and small conifers could be killed by underburns, thereby reducing competition for general-openings and gap-phase guild species.

Cumulative Effects. The cumulative effects discussion is at end of this section.

3.3.8 Environmental Consequences, Herbicide Use for DFPZ Maintenance and Noxious Weed Control on Gap-phase and General-openings Guild Species

3.3.8.1 Alternative A (No Action)

Direct and Indirect Effects. There would be no direct or indirect effects on gap-phase and general-openings guild species from the use of herbicides to maintain DFPZs and control noxious weeds.

Cumulative Effects. The cumulative effects discussion is at end of this section.

3.3.8.2 Alternatives C and G (No Herbicide Use)

Direct Effects. Herbicides are not proposed for use under alternatives C and G, so there would be no direct effects.

Indirect Effects. Noxious weeds would be controlled through integrated techniques that exclude the use of herbicides. There would likely be a greater cost per acre to control noxious weeds. In the absence of herbicides, DFPZs would be maintained through mastication and under burning. These effects would be the same as those discussed above in section 3.3.7.

Cumulative Effects. The cumulative effects discussion is at end of this section.

3.3.8.3 Alternatives B, D, and F (Herbicides Would be Used)

Approximately 1,954 acres would be treated with imazapyr at the rate of 0.25 pound acid equivalent (AE) / acre (see the "Glossary" for an explanation of acid equivalent). Up to 31 acres of broom seedlings may be treated per year for five years with triclopyr BEE at the rate of 1.5 pounds AE / acre. The effects are discussed below. The effects of surfactant Syl-tac® (Hasten® and Syl-gard®) and the marker dye Hi-light® Blue are also discussed below. There are approximately 5 acres of Butte County fritillary in an herbicide treatment unit. All known occurrences of rare plant species would be surrounded by a no-spray buffer of 50 feet.

Direct Effects. The direct effects of herbicide contact could include death or decreased fitness and a subsequent susceptibility to pathogens, insects, or inability to compete for resources. There would be no direct effects on known rare plant populations. All known occurrences would be buffered by a no-spray buffer of 50 feet. The buffer width is based on information from the Syracuse Environmental Research Associates Ecological Risk Assessment (SERA 2004b) and is described below.

There would be no direct or indirect effects from Syl-tac® (a blend of Hasten® and Syl-gard®). Hasten® is a modified vegetable oil that may be a mild irritant to the eyes. This material is not likely to produce secondary breakdown products that would act as toxins to rare plant species. Syl-gard® is a silicone-based surfactant that promotes the even spreading of the spray solution. It is considered slightly irritating to skin and severely irritating to eyes. There is no information presented on the toxicity of this material or degradation products to rare species; however, the use of buffers would drastically reduce any risk.

There should be no direct or indirect effects from Hi-light® Blue. According to David Bakke, Forest Service Region 5 pesticide coordinator, "This material is a water-soluble dye that contains no listed hazardous substances. It is considered to be virtually nontoxic to humans. The dye used in Hi-light® Blue is commonly used in toilet bowl cleaners and as a colorant for lakes and ponds" (SERA 1997).

The effects of imazapyr herbicide on rare plants was discussed in the 2003 HFQLG final supplemental EIS (which referred to rare plants as Special Status plants), and the analysis presented in this Slapjack Project EIS tiers to that document. In general, there is a lack of information on the toxicity of imazapyr to rare plants. According to the final supplemental EIS (USDA Forest Service

2003a), "A risk assessment was not completed, since quantitative values and levels of risk did not seem to be as apparent in the literature" (USDA Forest Service 2003a, page 129). Consequently, rare plants are assumed to be herbicide-sensitive species (USDA Forest Service 2003a, page 137). The SERA ecological risk assessments for imazapyr (SERA 2004b) and triclopyr BEE (SERA 2003) are incorporated by reference. These documents provide some information on potential toxicity to rare plants. It states that imazapyr is practically nontoxic to conifers, but it is toxic to many other nontarget plants (SERA 2004b, page 4-1). For the analysis presented in the SERA document, all rare species were assumed to be highly sensitive. The sugar beet is highly sensitive to herbicides and is used as a surrogate to measure toxicity levels. In agricultural settings, the sugar beet is planted in fields to detect the residual presence of chemicals in the soil. If the sugar beets show signs of herbicide toxicity, growers know not to plant their high-dollar crops. The SERA risk assessment uses a measure called the NOEC to measure the concentration at which damage occurs to rare species. (NOEC stands for "No Observable Effects Concentration" and is the dose that will not produce any negative "observable" effects.) If an applied dose of chemical (whether through drift or direct application) exceeds the NOEC, then there is some risk of plant damage. For example, the NOEC for imazapyr is 0.00049 pounds AE / acre (SERA 2004b, page 4-20). The application rate analyzed in the 2003 HFQLG final supplemental EIS is 0.25 pound AE / acre. A direct application of imazapyr at this rate would exceed the NOEC and certainly inflict damage, if not death of plants. The NOEC for triclopyr BEE is 0.0039 pound AE / acre. The application rate for the project is 1.5 pound AE / acre. This too would exceed the NOEC.

Herbicide drift is a recognized hazard for rare plant species. The SERA document states, "The primary hazard to nontarget terrestrial plants is unintended drift deposition or spray drift" (SERA 2004b, page 4-13). The HFQLG final supplemental EIS states, "The hazard posed to terrestrial plant species from herbicide application is primarily related to drift." It goes on to explain that impacts can be minimized by

- avoidance with the use buffers,
- spraying when wind is absent or blowing away, and
- using application methods other than spraying.

The third option (using application methods other than spraying) is not discussed because all herbicide applications would be applied by hand using backpack sprayers. Creating buffers of an appropriate size and timing chemical applications to avoid adverse affects are explained below.

Determining if the size of the buffer is warranted. A study performed by Segawa et al. (2001) examined dissipation and off-site movement of selected forestry herbicides on three national forests in the Sierra Nevada. All applications were made with backpack sprayers. The study collected vegetation samples after spraying to examine herbicide drift. Samples were collected at four distances from the application, ranging from 5 to 100 feet. A total of 168 samples were collected, and herbicide drift was detected 16 times. The majority of these positive detections were within 5 to 40 feet of the application. There were two positive detections between 80 and 100 feet of the application. These findings are supported by the SERA document (SERA 2004b). Drift calculations from the SERA document determine potential drift from backpack sprayers under two wind conditions. When applications are made in 0 to 5 mile per hour (mph) winds, droplets can move 23 feet. Applications

made in a 15 mph wind can potentially drift up to 68 feet (SERA 2004b, page 4-14). Based on this information, a 0 to 5 mph maximum wind has been incorporated into the project design, and 50-foot buffers would be applied to all known occurrences of rare plant species.

The risk to rare plants due to percolation of materials through the soil profile. The mobility of imazapyr and triclopyr was not analyzed in detail in the SERA ecological risk assessments (SERA 2003, 2004b). According to the SERA assessment, percolation is not considered a risk to rare plants because chemicals are transported below the root zone (SERA page 4-14).

The risk to rare plants from herbicide runoff after a rain event. There is a very low risk to rare plants from herbicide run-off after a rain event for the following reasons:

- All applications would be made in the summer and late fall. These are the dry times of the year in the Northern Sierra Nevada.
- Applications would be applied directly to target species; consequently, there would be very little chemical reaching the forest floor.
- The percent of effective ground cover for potential herbicide units is 90 percent. Any herbicide that does contact the forest floor would likely contact organic matter and be less subject to runoff (see the “Soils Report” in the project record for percent of effective ground cover by unit).

The potential for off-site movement of herbicides transported on soil particles that are blown by the wind is analyzed in the SERA Environmental Risk Assessments. Off-site movement from blown soil particles is very unlikely in the Slapjack Project area because high canopy cover acts as a shelter from the wind, and high levels of ground cover reduce the likelihood of soil movement.

Indirect Effects. Little is known about the pollination biology for the majority of the rare plant species discussed here. It is possible that some pollinators could be negatively impacted by herbicide application. Herbicide applications would target woody shrubs and tanoak. A reduction in the numbers of these species could create habitat for general-opening and gap-phase guild species.

Cumulative Effects. The cumulative effects discussion is at end of this “Botanical Resources and Noxious Weeds” section.

3.3.9 Existing Condition: Riparian Forest and Interior Forest Guild Species

Riparian forests are comprised of broad-leaved winter deciduous trees, forming closed canopies that are associated with low- to mid-elevation perennial and intermittent streams. Most stands are even-aged, which reflects the influence of floods on reproduction. For the purposes of this analysis, aquatic and lotic (living in running water) habitats are included in this guild. The major threats to this guild include hydrologic alteration, trails and trail users, mechanical treatments, roads, livestock trampling, and mining. There is one known occurrence of clustered lady slipper in the analysis area, which is approximately 0.01 acre in size. The other species have potential habitat but no known occurrences.

The interior forest guild species are found in protected microclimates and infrequently disturbed substrates. Because of mycorrhizal associations (a mutually beneficial association of a fungus and the roots of a plant such as a conifer), these species are intolerant of edge effects that change temperature, moisture, and other microclimate conditions. The primary threats to this guild are mechanical vegetation treatments, reforestation, grazing, stock trampling, catastrophic fire, firefighting and suppression activities, fuels reduction activities, prescribed fire, road development and maintenance, off-highway vehicle use, trails and trail users, camping, plant collecting, mining, and erosion. The clustered lady slipper is also considered in the interior forest guild. Potential habitat exists for the mountain lady slipper, olive phaeocollybia, and Siskiyou mountains huckleberry.

3.3.9.1 Fragility/Habitat Specificity

In the Sierra Nevada, the clustered lady slipper is found on moist north-facing slopes, drainages, and meadows in mixed conifer or red fir forest between the elevations of 4,500 and 7,000 feet. This plant is not as habitat-specific in the Klamath Range and in Oregon.

Round-leaved sundew (*Drosera rotundifolia*)

Guild	Riparian.
Abundance	It is known to occur in about 25 locations on the Plumas National Forest.
Range/ Distribution	Round-leaved sundew is known to occur in Europe, Asia, and North America. It is well distributed in the eastern United States. In the western United States, it is known to occur in California north to Alaska and east to Montana and Utah. Within California, it is known to occur in the North Coast, North Coast Ranges, Klamath Ranges, Cascade Range, and Sierra Nevada.
Within the Analysis Area	There is one known occurrence approximately 0.01 acre in size within the Slapjack Project area.
Trend	Unknown.
Fragility / Habitat Specificity	Round-leaved sundew is found in bogs, fens, and wet meadows. Threats to this species include plant collectors, changes in hydrology, sedimentation, and cattle trampling.

Clustered lady slipper (*Cypripedium fasciculatum*)

Guild	Interior forest and riparian.
Abundance	The occurrence numbers are from Draft Conservation Assessment (Kaye 2004). There are 16 documented occurrences on the Six Rivers National Forest, with population sizes that range from 2 to 60 plants; only 3 of the occurrences have been verified, the rest are historic or have not been relocated. The Shasta-Trinity National Forest has 29 occurrences, with population sizes ranging from 1 to 50 (average 10 plants); only half of the

occurrences have been verified. The Klamath National Forest has 97 occurrences, with population sizes ranging from 1 to 141 plants (from Klamath National Forest population records). The Mendocino National Forest has 50 occurrences totaling less than 1,400 stems. The Lassen National Forest has 1 occurrence, with a population size of about 50 plants. The Plumas National Forest has 101 occurrences, with population sizes ranging from 2 plants to over 3,000. The Tahoe National Forest has 8 occurrences, with population sizes of 1, 13, and less than 200.

Range/ Distribution

Known to occur in eight states in California, from Del Norte County to Sierra County. Also occurs in Colorado, Idaho, Montana, Utah, Oregon, Washington, and Wyoming. The Tahoe National Forest supports the southern-most occurrences of this species' range.

Within the Analysis Area

There is one known occurrence in the analysis area (about 0.13 acre), and no occurrences in the proposed treatment units.

Trend

Declining. The *Federal Register* (9/30/93) lists the habitat for this plant as declining. Details of population trends across its range are unknown. It can be assumed that the trend for this species is downward, given the complicated life history of this species, including the establishment of mycorrhizal relationships, limited establishment factors, apparent intolerance to intense disturbance, and occurrence of this species on lands available for timber harvest. The population on the Tahoe National Forest is declining due to habitat disturbance. The Lassen National Forest population was 60 plants in 1998 and 50 plants in 2001. However, on Plumas National Forest, many of the occurrences have been revisited and most relocated year after year. Two occurrences on the Plumas are large, having more than 2,000 stems and the other over 3,000 stems. Small population sizes with risk of local extirpation, coupled with monitoring inconsistency and the fact that some of the populations have not been visited in over a decade, contribute to concerns for this species.

Fragility / Habitat Specificity

Clustered lady slipper habitat is very broad, occurring on various parent materials from ultramafic, schist, and limestone-derived soils. In Oregon and California, this species is associated with Douglas-fir-dominated and mixed conifer forests in the mid to late seral stands with structures that allow some light to reach the forest floor. Occurrences have also been documented in riparian areas. Exceptions to this general habitat description do exist, which demonstrates the difficulty in identifying leading habitat characteristics. Mycorrhizal fungi play a pivotal role in the biology of orchids. Several stages in the orchid's life-cycle, especially early stages of seedling development, depend on associations with fungi. Given this essential dependence, the habitat needs of the fungi must also be met.

Brownish beaked-rush (*Rhyncospora capitellata*)

Guild	On the Plumas National Forest, it is known to occur on the Feather River Ranger District in several locations.
Range/ Distribution	Found throughout the eastern United States, the species is disjunct in California and Oregon. The known California distribution includes Butte, Mariposa, Nevada, Plumas, Shasta, Sonoma, Tehama, and Trinity Counties.
Within the Analysis Area	About 0.4 acre.
Trend	Unknown.
Fragility / Habitat Specificity	The species is found in lower montane coniferous forests, meadows and seeps, marshes, fens, and swamps.

Henderson's bent grass (*Agrostis henersonii*)

Guild	Riparian forest.
Abundance	It is known to occur in several locations on the Feather River Ranger District of the Plumas National Forest.
Range/ Distribution	This species is known to occur in the California counties of Butte, Calaveras, Merced, Placer, Plumas, Shasta and Tehama and in Oregon.
Within the Analysis Area	There is 0.1 acre in the analysis area and no occurrences in the proposed treatment units.
Trend	Unknown.
Fragility / Habitat Specificity	This taxon is found in vernally moist swales in granitic rock.

Three-leaved beakseed (*Bulbostylis capillaris*)

Guild	Riparian forest.
Abundance	On the Plumas National Forest, it is known from Little Bald Rock, Big Bald Rock, Hartman Bar Ridge, and near Tamarack Flat.
Range/ Distribution	It is known to occur in California from Fresno County north through Tehama County. It is also known to occur in Arizona, New Mexico, Texas, and Oregon and extends beyond the western states into eastern North America, the Caribbean, Central America, and eastern Asia.

Within the Analysis Area	There is approximately 0.2 acre in the analysis area, with no occurrences in the proposed treatment units.
Trend	Unknown.
Fragility / Habitat Specificity	It is found in meadows and grassy clearings, including vernal creek beds and vernally moist sandy depressions.

Tall checker bloom (*Sidalcia gigantea* sp. *nova*)

Guild	Riparian forest.
Abundance	This taxon is thought to be a separate species from its current placement as S*idalcea celata* in the Jepson Manual of Higher Plants of California. Recent observations (Oswald 2002; Clifton 2005) have separated the robust Sierran populations into a new species: *Sidalcea* "gigantea," which has yet to be described. On the Plumas National Forest, it is known to occur on the Feather River Ranger District in several locations.
Range/ Distribution	Records of this taxon have been kept on the Plumas National Forest since 1999.
Within the Analysis Area	There is approximately 0.02 acre in the analysis area, with no plants in the proposed treatment units.
Trend	Unknown.
Fragility / Habitat Specificity	These plants are typically found in middle- to high-elevation conifer forests (2,100–5,400 feet). Although not in the wettest areas, individuals are found in moist areas or areas with nearby water.

3.3.10 Environmental Consequences: Effects of DFPZ Construction, Group Selection, and Individual Tree Selection Treatments on Riparian Forest and Interior Forest Guild Species

3.3.10.1 Alternative A (No Action)

Direct Effects. There would be no direct effects from DFPZ construction and group selection treatments.

Indirect Effects. The no-action alternative would lead to denser, thicker forests that are more prone to high-intensity wild fires that would likely create conditions favorable to noxious weed invasion.

3.3.10.2 All Action Alternatives

There are no known occurrences of riparian or interior forest guild species in the proposed treatment units. However, there could be incidental impacts on unknown populations, and these effects are described below.

Direct Effects. There would be no mechanical treatments in riparian areas except in plantations, which are highly disturbed and do not contain potential habitat for riparian species. Only hand treatments would be allowed in designated riparian areas; consequently, direct impacts on the riparian forest guild associates would be minimal.

Heavy equipment used for mastication, thinning, and biomass removal could destroy above-ground parts of plants in interior forest areas. They could be crushed, broken, or uprooted by equipment. Underburning could kill these rare species; however, they have all evolved with frequent low-intensity fires. The timing of prescribed burns is critical since annuals would not be affected by fall burns that take place after they have set seed, but they could be affected in the spring when they are growing and flowering. New research indicates that spring burns are often cooler and patchier than fall underburns. If prescribed burns are too hot, the impact on rare plant species could be greater because high-intensity fires could sterilize the soil, thereby killing the seedbank. Firelines and piles would be placed to avoid known occurrences of rare plants. Controlled areas for piles have been identified by unit (refer to the “Botany Protection Plan” in the project record, appendix B of the Botany BA/ BE) and would be designated in the field prior to pile construction.

Indirect Effects. Canopy removal would change relative humidity and sunlight interception on the forest floor, resulting in a modification of interior forest conditions on which these guild members depend. As a result, members would be negatively impacted. Also, mycorrhizal fungi play a pivotal role in the biology of some interior forest species. For example, several stages in the orchid’s life cycle, especially early stages of seedling development, depend on associations with fungi. Given this essential dependence, the habitat needs of the fungi must also be met. Given the reproductive and establishment complexity of this species, microhabitat variables appear to be important; therefore, the microhabitat where these populations occur is considered fragile. Activities that disturb the soil could break up the mycelium, thereby negatively impacting these guild associates.

3.3.11 Environmental Consequences: Effects of Herbicide Use for DFPZ Maintenance and Noxious Weed Control on Riparian Forest and Interior Forest Guild Species

3.3.11.1 Alternative A (No Action)

Direct and Indirect Effects. There would be no direct or indirect effects.

3.3.11.2 Alternatives C and G (No Herbicide Use)

Direct Effects. There would be no direct effects from these alternatives because herbicide use is not proposed.

Indirect Effects. In the absence of herbicides, DFPZs would be maintained through mastication and underburning. These effects would be the same as those discussed above for gap-phase and general-openings guild species.

Noxious weeds would be controlled through integrated techniques, excluding the use of herbicides. There would likely be a greater cost per acre to control noxious weeds.

3.3.11.3 Alternatives B, D, E, and F (Herbicide Use)

Approximately 1,954 acres in DFPZs would be treated with imazapyr under alternatives B, D, E, and F. Triclopyr BEE could be used to treat up to 31 acres of broom seedlings per year for five years. The surfactant Syl-tac® (Hasten® and Syl-gard®) and the marker dye Hi-light® Blue would also be used. The proposed herbicide treatment units contain no interior forest or riparian forest guild associates.

Direct and Indirect Effects. The direct and indirect effects would be the same as those discussed above for gap-phase and general-openings guild species. The direct effects of herbicide contact could include death or decreased fitness and a subsequent susceptibility to pathogens, insects, or inability to compete for resources. There would be no direct effects on known rare plant populations because all known occurrences would be protected by a 50-foot no-spray buffer.

3.3.12 Existing Condition: Serpentine Guild Species

Serpentine species are limited to areas with serpentine soils. These soils frequently have high levels of heavy metals and low available plant nutrients, specifically low calcium and high magnesium.

The serpentine species that are known to occur in the analysis area are described below.

Layne's butterweed (*Senecio layneae*)

Guild	Serpentine.
Abundance	Layne's butterweed is known to occur on private and preserve land in the gabbro (dark course-grained igneous rock) habitat near Pine Hill in western El Dorado County. There are three known occurrences on the Eldorado National Forest (also in El Dorado County), six occurrences (two on Bureau of Land Management [BLM] land and four on the Plumas National Forest) in Yuba County, and ten known occurrences in Tuolumne County, all in the vicinity of the Red Hills (6 of these occurrences are found in the BLM Red Hills Area of Critical Environmental Concern), and three of the other Tuolumne County occurrences are on public land managed by the BLM.
Range/ Distribution	Most known sites are scattered within a 40,000-acre area in western El Dorado County that includes the Pine Hill formation (gabbro soils) and the adjacent serpentine. A few other colonies occur on serpentine soils in the Eldorado National Forest in El Dorado County, on serpentine soil in the Plumas

National Forest and the BLM land in Yuba County, and on the serpentine soils of the Red Hills of Tuolumne County, mostly on land managed by the BLM.

Within the Analysis Area There are approximately 13.7 acres in the analysis area and approximately 0.5 acre in a proposed underburn unit.

Trend The populations on Forest Service land and state preserves in El Dorado County are relatively stable, but the trend is unstable to declining in areas where habitat has been lost to residential/commercial development. Documented populations on public lands in Tuolumne and Yuba Counties (Forest Service and BLM lands) are afforded some protection from management activities and development. Extensive surveys in El Dorado County (Pine Hill Preserve) are planned in the next two years (BLM, Al Franklin, pers. comm.).

Fragility / habitat specificity Layne's butterweed grows in open rocky areas in chaparral plant communities, as well as woodland and forest communities, primarily on gabbro-derived soils, with the widely scattered populations found generally on serpentine derived soils. It can be considered an early successional species that occupies temporary openings on gabbro and serpentine soils and is suppressed, and perhaps eliminated, as taller vegetation crowds out sunlight.

Sanborn's onion (*Allium sanbornii* v. *sanbornii*)

Guild Serpentine.

Abundance The species is found at elevations of 2,500–3,200 feet in the southwestern portions of the Plumas National Forest on serpentine substrate in Butte and Yuba Counties.

Range/ Distribution The species occurs in widely scattered populations in northern California and adjacent Oregon.

Within the Analysis Area There are approximately 1.3 acres in the analysis area and no occurrences in proposed treatment units.

Trend Unknown.

Fragility / Habitat Specificity Typically found on serpentine outcrops, the species is occasionally found on granitic or volcanic substrates as well.

McNab cypress (*Cupressus macnabiana*)

Guild Serpentine.

Abundance There are four occurrences on the Plumas National Forest.

Range/ Distribution	It is distributed from the Siskiyou Mountains southward to Sonoma County and also in the Sierra foothills from Shasta County south to Yuba County.
Within the Analysis Area	There are approximately 19 acres of McNab cypress in the analysis area and no occurrences in proposed treatment units.
Trend	Unknown.
Fragility / Habitat Specificity	The species is associated with serpentine/ultramafic soils. Recent work by Safford and Harrison (2004) suggests that California serpentine plant communities may be dependent on fire for recruitment. It is suspected that this species requires bare mineral soil for seedling regeneration. This rare species produces serotinous ("closed") cones that require fire for seed dispersal. In the absence of fire, environmental conditions are not present that support successful seedling establishment. This is also supported by work done on the closely related Sargent cypress (*Cupressus sargentii*), in which seedling recruitment was observed post fire (Ne'eman et al. 1999).

Northern Sierra rayless daisy (*Erigeron petrophilus* var. *sierrensis*)

Guild	Serpentine.
Abundance	It is known to occur on the Feather River and Mount Hough Ranger Districts of the Plumas National Forest.
Range/ Distribution	This species is known to occur along the western slope of the Sierra Nevada from Butte County to El Dorado County.
Within the Analysis Area	There are approximately 11 acres in the analysis area, with 0.13 acre in a proposed treatment unit.
Trend	Unknown.
Fragility / Habitat Specificity	It is found on gravelly or rocky slopes of serpentine in openings and in open mixed conifer and red fir forest.

Ahart's sulfur flower (*Erigogonum umbellatum* var. *ahartii*)

Guild	Serpentine.
Abundance	There are eight known occurrences: three in the area around Paradise and five in the area around Woodleaf. All of these occurrences are in serpentine substrates.
Range/ Distribution	This newly described variety is found on serpentine in the area around Paradise in Butte County and in the Woodleaf area of Yuba County.

Within the Analysis Area	There is 0.5 acre in the analysis area and no occurrences in proposed treatment units.
Trend	Unknown.
Fragility / Habitat Specificity	This species is found on serpentine in open chaparral and mixed conifer plant communities.

Bacigalupi's yampah (*Perideridia bacigalupii*)

Guild	Serpentine.
Abundance	It is known to occur in several locations on the Plumas National Forest in the Feather River Ranger District.
Range/ Distribution	This species is known to occur from Madera County to Butte County.
Within the Analysis Area	There is approximately 0.3 acre in the analysis area and 0.1 acre in proposed treatment units.
Trend	Unknown.
Fragility / Habitat Specificity	This yampah is found in openings in brush on low-elevation serpentine outcrops and serpentine derived soils.

3.3.13 Environmental Consequences: Effects of DFPZ Construction, Group Selection, and Individual Tree Selection Treatments on Serpentine Guild Species

3.3.13.1 Alternative A (No Action)

Direct Effects. There would be no direct effects.

Indirect Effects. There could be a gradual decline in these species in the absence of disturbance and fire, and there would be an increased risk from catastrophic fire in the absence of underburning to reduce fuel loads of brush and other dead material.

3.3.13.2 All Action Alternatives

Approximately 110 acres of serpentine soils (peridotite parent material)[1] would be treated with mastication and harvest. No known occurrences of serpentine guild members are known to occur in proposed harvest or mastication units. There are approximately 185 acres of serpentine habitat that

1. Serpentine soil determinations were determined based on the Plumas National Forest soils GIS layer using peridotite as the parent material. Surveyors Clifton and Buck reported that the GIS was a good predictor of serpentine soils in the field (Buck and Clifton 2005).

would be underburned with this proposal. There is approximately 0.5 acre of Layne's butterweed in a proposed underburn unit.

Direct Effects. Fire may kill individual plants; however, it is known that most habitats in the northern Sierra Nevada coevolved with wildfire. However, the fire-return interval is not clearly understood for all areas including serpentine habitats.

Indirect Effects. The soil chemistry and physical characteristics of serpentine habitats make them particularly vulnerable to increased rates of erosion from activities such as off-road vehicle use, rock collection and mining, and management activities. Depending on specific site characteristics, timber harvest could worsen erosion. Mastication activities would occur on approximately 63 acres of serpentine soil. Mastication can create a thick layer of duff than could potentially have negative effects on serpentine species. According to Hugh Safford, Forest Service Region 5 ecologist, a duff layer acts as a buffer to the serpentine soil, allowing non-serpentine plant species to colonize a site and potentially exclude the rare plants.

3.3.14 Environmental Consequences: Effects of Herbicide Use for DFPZ Maintenance and Noxious Weed Control on Serpentine Guild Species

3.3.14.1 Alternative A (No Action)

Direct and Indirect Effects. There would be no direct or indirect effects.

3.3.14.2 Alternatives C and G (No Herbicide Use)

Direct Effects. There will be no direct herbicide effects with these alternatives.

Indirect Effects. In the absence of herbicides, DFPZs would be maintained using mastication and underburning. These effects would be the same as those discussed above for gap-phase and general-openings guild species.

Noxious weeds would be controlled through integrated techniques, excluding the use of herbicides. There would likely be a greater cost per acre to control noxious weeds in the short term.

3.3.14.3 Alternatives B, D, E, and F (Herbicide Use)

Approximately 1,954 acres would be treated with imazapyr under these alternatives. Triclopyr BEE would be used to treat up to 31 acres of broom seedlings per year for five years. The surfactant Syl-tac® (Hasten® and Syl-gard®) and the marker dye Hi-light® Blue would also be used. Approximately 27 acres of serpentine habitat could be treated with imazapyr to control brush to maintain DFPZ effectiveness. There is approximately 0.13 acre of Northern Sierra rayless daisy in this treatment area; it would be protected with a 50-foot no-spray buffer.

Direct and Indirect Effects. The direct and indirect effects would be the same as those discussed above for gap-phase and general-openings guild species. The direct effects of herbicide contact could include death or decreased fitness, with a subsequent susceptibility to pathogens, insects, or inability

to compete for resources. There should be no direct effects on known rare plant populations because all known occurrences would be protected by a 50-foot no-spray buffer.

3.3.15 Affected Environment (Existing Conditions): Noxious Weeds

Tables 3-7 and 3-8 list the noxious weeds that are known to occur in the analysis area. No California Department of Food and Agriculture A- or B-rated noxious weeds were found in proposed treatment units. The California Department of Food and Agriculture's noxious weed list (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/winfo_list-pestrating.htm) divides noxious weeds into categories A, B, and C. The A-listed weeds are those for which eradication or containment is required at the state or county level. With B-listed weeds, eradication or containment is at the discretion of the County Agricultural Commissioner. The C-listed weeds require eradication or containment only when found in a nursery or at the discretion of the County Agricultural Commissioner.

Table 3-7. Acres of noxious weeds in the analysis area and proposed treatment units.

Common Name	Species	144,490-Acre Analysis Area (total acres of weeds)	Proposed Treatment Units (total acres)
Barbed goatgrass	*Aegilops triuncialis*	0.0	0
Bull thistle	*Cirsium vulgare*	Common	Common
English ivy	*Hedera helix*	0.1	0.01
French broom	*Genista monspessulana*	10.6	9.3
Klamathweed	*Hypericum perforatum*	Common	Common
Medusahead	*Taeniatherum caput-medusae*	Two plants	0
Scotch broom	*Cytisus scoparius*	94.9	0.3
Skeleton weed	*Chondrilla juncea*	0.1	0
Spanish broom	*Spartinum junceum*	0.5	0.5
Yellow starthistle	*Centaurea solstitialis*	0.5	0.001

Table 3-8. Acres of noxious weeds by treatment prescription.

Common Name	Species	Treatment Prescription	Acres of Noxious Weeds
English ivy	*Hedera helix*	Harvest	0.01
French broom	*Genista monspessulana*	Harvest	0.70
French broom	*Genista monspessulana*	Handcut / pile burn	0.06
French broom	*Genista monspessulana*	Masticate	0.65
French broom	*Genista monspessulana*	Underburn	7.90
Scotch broom	*Cytisus scoparius*	Harvest	0.12
Scotch broom	*Cytisus scoparius*	Masticate	0.001
Scotch broom	*Cytisus scoparius*	Underburn	0.20
Spanish broom	*Spartinum junceum*	Underburn	0.50
Yellow starthistle	*Centaurea solstitialis*	Underburn	0.001
Yellow starthistle	*Centaurea solstitialis*	Group selection	0.02

Two weeds that are common in the analysis area are Klamathweed and bull thistle. Klamathweed can be found along most Forest Service roads on the Plumas National Forest that are not shaded by overstory canopy. Plants are usually scattered within the road prism, rarely forming dense stands or invading the adjacent forest. Plant distribution appears to be most heavily concentrated at the lower elevations (1,000–4,000 feet), with plants becoming less common at the higher elevations. The Klamathweed beetle (*Chrysolina quadrigemina*) is a very effective biocontrol agent, which keeps overall Klamathweed populations low (Borror 1992).

Bull thistle was probably introduced in North America during colonial times. It is naturalized and widespread throughout North America and is found on every other continent except Antarctica (Bossard 2000). It is most common in disturbed areas with little to no canopy and, like Klamathweed, is often found along roads with little shade cover. It is common along most Forest Service roads on the Plumas National Forest, although on the Feather River Ranger District, it normally does not form dense thickets. Although not native, bull thistle plants provide forage for many native insect species. Butterflies and bees are frequently observed on these plants. (Electronic images of insect activity on bull thistle inflorescences are available by contacting Chris Christofferson, assistant botanist, Feather River Ranger District, Plumas National Forest.) Furthermore, bull thistle does not spread by rhizomes or other creeping roots and does not produce allelopathic chemicals (substances released by one plant species that inhibit the germination or growth of competitor plants of the same or different species) like some other A- and B-rated noxious weeds (Bossard 2000). Two biocontrol insects (Urophora stylata and Rhinocyllus conicus) have been released and help reduce population levels.

Scotch broom (*Cytisus scoparius*), French broom (*Genista monpessulana*), and Spanish broom (*Spartium junceum*) are also present in the analysis area and in proposed treatment units. There are approximately 106 acres in the analysis area, and much of this is on private property. There are approximately 10 acres in the proposed treatment units. Overall, this is a relatively small amount of broom. However, this project has the potential to create favorable conditions for broom proliferation. Control measures have been designed into the project and are included in all alternatives, except the no-action alternative The following control measures have been identified:

1. Broom and other noxious weed infestations will be identified on the ground with orange noxious weed flagging prior to equipment entering infested units.

2. Broom infestations will be considered “controlled areas” that will exclude all equipment. These areas will be treated with hand equipment only to prevent the spread of seeds.

3. Mature broom plants will be killed by cutting them during summer and late fall when plants are water stressed.

4. Seedlings may be treated with a combination of techniques including herbicides, back-pack flamers, motorized brush cutters, weed wrenches, and hand pulling.

5. Underburn areas will promote seed germination and will likely have large quantities of seedlings.

6. Units with any amount of broom within or immediately adjacent to the unit are considered "infested." Any equipment operating within an infested unit shall be cleaned prior to leaving that unit and entering an uninfested unit.

7. No mechanical firelines shall be constructed in an infested unit.

8. The number of acres analyzed for treatment (31 acres) with this project exceeds the number of known infested acres (10 acres). The Forest Service has taken into account the possibility of a flush of seedlings following underburns and other treatments that remove understory vegetation.

3.3.16 Environmental Consequences: Effects of DFPZ Construction, Group Selection, and Individual Tree Selection Treatments on Noxious Weeds

3.3.16.1 Alternative A (No Action)

Direct Effects. There would be no direct effects.

Indirect Effects. Some weeds would become less abundant as the forest canopy continues to close in; however, long-lived seeds would remain in the soil until the next catastrophic fire, at which point conditions would likely be ideal for broom proliferation.

3.3.16.2 All Action Alternatives

Direct Effects. Mechanical treatments would remove overstory canopy and disturb the soil, creating conditions that favor noxious weed establishment. There would be approximately 221 acres of group selection harvest with one known infestation of yellow starthistle. Group selection units would leave little overstory canopy and result in a high level of ground disturbance. There would be approximately 1,110 acres of mastication units; within these units, there is approximately 0.7 acre of noxious weeds. This treatment would be less likely to create conditions that favor noxious weed establishment because there would be 40–50 percent canopy retention. Also, mastication treatments would produce a layer of ground-up material that would act like a mulch to reduce germination of new seedlings. Mastication units with broom have been identified. Underburn units contain approximately 9 acres of noxious weeds. Mature broom plants would likely be killed with underburns. Firelines would create habitat for broom and other nonnative plant species. The construction of firelines with dozers has been excluded from all units with broom infestations. It is anticipated that this project will enable the Forest Service to decrease levels of broom infestation through the application of controlled burns and other associated treatments.

Indirect Effects. Environmental conditions could become more favorable to noxious weed establishment as a result of the canopy removal and ground disturbance associated with group selection treatments.

3.3.17 Environmental Consequences: Effects of Herbicide Use for DFPZ Maintenance and Noxious Weeds

3.3.17.1 Alternative A (No Action)

Direct Effects. There would be no direct effects.

Indirect Effects. There would be no indirect effects.

3.3.17.2 Alternatives C and G (No Herbicide Use)

Direct Effects. There would be no direct effects because herbicide use is not proposed under these alternatives.

Indirect Effects. In the absence of herbicides, noxious weeds would be killed through the use of other control tactics such as backpack torches, hand pulling, and brush cutters.

3.3.17.3 Alternatives B, D, E, and F (Herbicide Use)

These alternatives propose that approximately 1,954 acres would be treated with imazapyr. Triclopyr BEE would be used to treat up to 31 acres of broom seedlings per year for five years. The surfactant Syl-tac® (Hasten® and Syl-gard®) and the marker dye Hi-light® Blue are also be discussed here.

Direct and Indirect Effects. Herbicides would kill noxious weeds. Other nontarget species could be killed as a result of herbicide application for noxious weeds. A consequence of this would be the loss of native species that provide competition for noxious weeds. The death of nontarget species is expected to be minimal because all applications would be done by hand with backpack sprayers.

3.3.18 Past, Present, and Reasonably Foreseeable Future Actions

Future actions listed in the Schedule of Proposed Actions, and actions related to DFPZ maintenance activities, were considered in the analysis. Land management activities in the project area are summarized below, by decade, and are subdivided by watershed. Table 3-9 lists the activities that have taken place on federal and private land since the 1980s. Actions on private land prior to 1990 were not available for the analysis. The majority of past activities have been on private land and occurred in the 2000s. Figure 3-3 lists the past, present, and future timber management treatment acres in the Slapjack Project area.

Components of past actions that should be considered. There are four important components of past actions that should be considered when accessing the impact of past actions.

- What are habitat requirements of the species in question — does the species require disturbances or are they extremely sensitive to disturbances?
- What is the intensity of the disturbance — is it a clearcut or a light thinning?
- What is the size or scale of the disturbance — is it a 100-acre clearcut or 2-acre clearcut?
- How long does it take the landscape to recover those environmental components necessary to support the species in question?

Table 3-9. Activities on federal and private lands since the 1980s.

Decade	Type of Activity	Subwatershed						Grand Total
		Bullard's Bar Reservoir	Dobbins Creek	Frey Creek	Lower Dry Creek	McCabe Creek	Ponderosa Reservoir	
1980s	Clearcut			22.9	494.1		13.8	1,168.7
	Overstory removal							12.5
	Salvage			8.3			24.9	33.2
	Selection				86.6			86.6
	Thinning						44.6	44.6
1980s Total		**650.4**		**31.3**	**580.8**		**83.2**	**1,345.7**
1990s	Clearcut	329.6		36.6	87.9		120.2	574.3
	Rehabilitation				12.5		8.6	21.1
	Salvage	16.2						16.2
	Seed tree removal	1.3			2.1		87.4	90.8
	Selection	93.0			10.8		4.5	108.3
	Shelterwood removal	44.6	637.9					110.2
	Thinning	414.6	12.5		53.4		13.2	481.2
1990s Total		**899.3**		**36.6**	**166.8**		**233.8**	**1,402.1**
2000s	Clearcut	436.4		33.3	178.6		416.4	1,077.5
	Group selection	873.5	2.2		51.5		150.2	1,077.4
	Rehabilitation	37.3	9.3		237.3		226.1	510.0
	Salvage	288.8						288.8
	Seed tree removal	43.1		184.8			213.5	441.4
	Selection	95.3					306.4	401.7
	Shelterwood removal	797.2	637.3	78.2	564.6	291.1	1,693.7	4,062.0
	Thinning	34.1					38.7	72.8
2000s Total		**2,605.7**	**661.5**	**296.3**	**1,032.0**	**291.1**	**3,045.0**	**7,931.7**
Future	Clearcut	73.7		11.0	23.0		52.7	160.4
	Group selection	373.7		30.8			578.6	983.1
	Rehabilitation						15.9	15.9
	Sanitation salvage	67.9						67.9
	Selection	85.5					75.3	160.9
	Shelterwood removal	638.6			403.6		58.2	1,100.3
Future Total		**1,239.4**		**41.8**	**426.5**		**780.8**	**2,488.5**
	Grand Total	**5,394.8**	**727.2**	**405.9**	**2206.1**	**291.1**	**4,142.8**	**13,167.9**

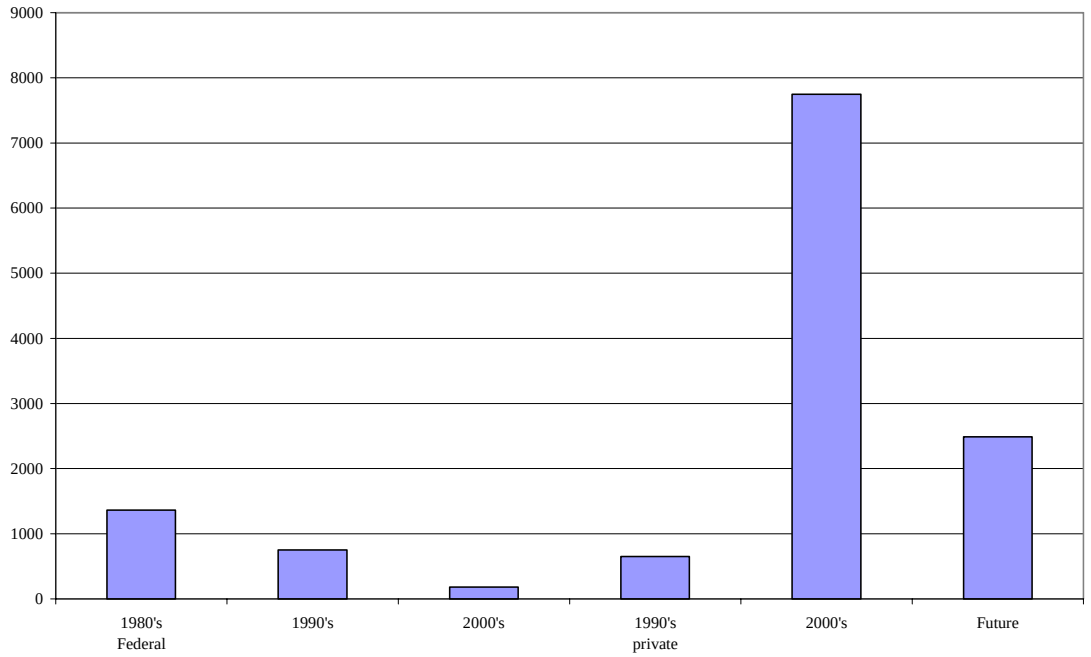

Figure 3-3. Past, present, and future timber management treatment acres in the Slapjack Project area.

The effects of past clearcutting and thinning on general-openings, gap-phase, and serpentine species. In general, past activities that exposed bare mineral soil and reduced the canopy are beneficial for general opening guild associates. These benefits would diminish through time as shrubs and trees return to the disturbed site. General openings species may have been negatively impacted from disturbances that completely removed the overstory. These species may be lost from the site until overstory trees return to the site and provide shade. However, activities such as thinning have likely been beneficial to these guild associates because competing vegetation is removed.

The effects of past clearcutting and thinning on riparian and Interior forest species. The effect of clearcutting is likely to be a long term loss of habitat for these guild associates. Many of the habitat components on which they rely are not completely understood. However, it is known that they are frequently found in areas with intact canopy. There may be a synergistic interaction between the habitat components that create conditions suitable for some rare species. The effect of thinning may be beneficial or negative depending on the species in question and the level of disturbance.

The effects of future projects on rare species. There are approximately 5,000 acres of future timber management projects in the analysis area—these are almost completely on private land. Only 30 acres of future noxious weed control projects are planned on federal land. The effects of these projects on rare species depend on the species in question and the level of project-specific mitigations. There would be a low risk that general openings and gap-phase species may be negatively impacted, but there would be an elevated risk to interior forest and riparian guild associates.

3.3.19 Summary of Cumulative Effects

3.3.19.1 Alternative A (No Action)

Species in the gap-phase and general-openings guilds would likely decline with the implementation of the no-action alternative. These species require openings in the forest, and in the absence of fire and other disturbances, the forest canopy would become dense and exclude these species. As a result of tremendous fuel loading and high risk to local communities, fire suppression would likely continue in the analysis area. These species would be out-competed by brush and trees. However, it is unlikely that alternative A would result in the extirpation of any rare plants in these guilds in the analysis area due to the level of disturbance associated with private land (approximately 80 percent of the analysis area is private property).

It is likely that rare plant species in the serpentine guild would be less impacted by this alternative because serpentine areas are not as heavily vegetated due to soil toxicity and low nutrient availability. However, these areas historically burned, and fire suppression has resulted in a build up of woody shrubs. A consequence of this is that the rare plants in the serpentine guild cannot compete with other plants for sunlight and other nutrients. Riparian and interior forest species would be the least impacted by the no-action alternative. These plants tolerate high levels of shade; however, encroachment of riparian areas by conifers and other nonriparian plants would likely continue with implementation of alternative A.

The no-action alternative would increase the risk of catastrophic wildfires in the analysis area. A frequent result of catastrophic wildfires, and the corresponding suppression activities, is the formation of conditions favorable to noxious weed invasion. Once these species are established, it can be costly to remove them.

3.3.19.2 All Action Alternatives

The extent of cumulative effects would depend on the management of potential direct and indirect effects, as well as the attributes of rare plant species located in the analysis area, their distribution in the analysis area, and the ability to design future projects with these rare plant attributes in mind. Overall, management of the direct and indirect effects through project design and mitigation measures would likely minimize the potential for adverse cumulative effects. There would be little difference in cumulative impacts between the action alternatives due to site-specific mitigations. The primary difference between these alternatives is the use of herbicides for DFPZ maintenance and noxious weed control. The use of herbicides would constitute a greater risk to rare plant species; however, due to site-specific mitigation measures, the risk would be minimal. Adverse cumulative effects are not expected from implementation of the Slapjack Project for the following reasons:

- The analysis area has been adequately surveyed for rare species.
- Projects over the past 20 years have incorporated protection measures for rare species, and as a result, the lingering effects of past actions on rare plant species are minimal (the primary lingering effect of past actions is that of fire suppression).
- This project has incorporated design criteria to ensure the protection of rare plant species; these include

  - controlled areas for herbicide treatments,
  - controlled areas for pile burning, and
  - Limited Operating Periods to protect sensitive developmental stages.
- The area has been adequately surveyed for noxious weeds, and treatments have been designed to eliminate equipment contact with infested areas and to use integrated management techniques to eliminate spread and contain the current infestation.
- Gap-phase and general-opening guild species would benefit from understory canopy thinning and the creation of openings.
- Serpentine guild associates would benefit from underburning.
- A minimal amount of riparian habitat would be affected by this project.
- Interior forest guild associates would be minimally impacted. There are no known occurrences in the proposed treatment units. Also, in the analysis area, the large tracts of land that have been set aside can act as reservoirs for these guild associates; these include approximately 5,500 acres of northern spotted owl Protected Activity Centers in the analysis area according to the Joanna Arroyo, assistant wildlife biologist on the Feather River Ranger District. There are 150 acres of Off Base and Deferred Lands and 13,000 acres of late-successional old-growth rank 4 stands. These areas contain stands of large-diameter trees and likely possess habitat for interior forest guild species. According to table 2 of the Forest Plan, the standards and guidelines applicable to the HFQLG Pilot Project area, timber harvest is not permissible in these areas. Also, direction is given to avoid late-successional old-growth rank 5 stands during DFPZ construction (rank 5 stands—a HFQLG land allocation—contain trees that are more than 24 inches diameter at breast height [dbh]). Downed wood debris would provide necessary habitat requirements for some of these guild associates.

3.3.20 Determination

The effects Determination discussed below is based on professional experience and judgment, existing information, including existing condition of the analysis area, and the potential impacts of the alternatives. An effects determination is also the culmination of potential direct, indirect, and cumulative effects. Even if the potential direct effects are low, there sometimes may be the potential for the indirect or cumulative effects to affect the viability of the species. xxx

3.3.20.1 Determination for U.S. Fish and Wildlife Listed Threatened and Endangered Species

Alternative A (No Action). May affect and is likely to adversely affect *Senecio layneae*.

All Action Alternatives. May affect but not likely to adversely affect *Senecio layneae*.

3.3.20.2 Basis of Determination for Senecio Layneae

Within the analysis area, *Senecio layneae* is known from four occurrences, totaling approximately mapped 13.7 acres. The acreage estimates are based on 2004 survey data (Buck and Clifton). Approximately 0.5 acre of *S. layneae* is within an underburn unit. No other areas containing this plant would be treated under the Slapjack Project or any other project within the scope of future foreseeable actions. The recovery plan for *S. layneae* states that, "In most cases active management of the land is necessary to maintain and enhance habitat values for the species covered in this recovery plan." It goes on to explain, "The only practical approach is adaptive management, where management is applied, population responses are monitored, the outcome is evaluated, and management is readjusted accordingly" (USFWS 2002).

The application of a fall underburn may kill mature *S. layneae*. However, other woody shrubs and small trees that currently occupy the site may be killed as well. Baad and Hanna (1987), as cited in the USFWS Recovery Plan states that *S. layneae* is an early successional species that occupies temporary openings on gabbro or serpentine soils and is eliminated as vegetation grows up around it. This project would reduce such vegetation. Also, alteration of a natural fire regime is listed as one of the four major threats to this species (USFWS 2002). This project would initiate the first steps to return the area where *S. layneae* is found to a more historic fire regime.

3.3.20.3 Determination for U.S. Forest Service Sensitive Species

Alternatives A through G (All Alternatives). May impact individuals but not likely to cause a trend toward federal listing or loss of viability to *Allium jepsonii*, *Arabis constancei*, *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lineare*, *Botrychium montanum*, *Bruchia bolanderi*, *Calycadenia oppositifolia*, *Calystegia atriplicifolia* ssp. *buttensis*, *Clarkia biloba* ssp. *brandegeae*, *Clarkia gracilis* ssp. *albicaulis*, *Clarkia mosquinii*, *Clarkia stellata*, *Cypripedium fasciculatum*, *Cypripedium montanum*, *Fritillaria eastwoodiae*, *Hydrothyria venosa*, *Lewisia cantelovii*, *Lupinus dalesia*, *Meesia triquetra*, *Meesia uliginosa*, *Monardella follettii*, *Monardella stebbinsii*, *Oreostemma elatum*, *Penstemon personatus*, *Sedum albomarginatum*, and *Senecio eurycephalus* var. *lewisrosei*.

The basis for the determination for Sensitive species include the following:

1. Adequate surveys have been performed in the Slapjack project area.

2. Protection measures and changes in prescriptions have been applied.

3. Gap-phase and general-openings guild associates respond positively to disturbances, which create openings and reduce competition from woody shrubs.

4. Serpentine guild species would benefit from the reintroduction of fire through underburns.

5. There are no interior forest or riparian associates located in the treatment units. There are over 13,000 acres of late-successional old-growth stands and 5,500 acres of California spotted owl Protected Activity Centers in the analysis area that likely contain habitat for these associates.

3.4 Economics

3.4.1 Introduction

The economic environment of the Plumas National Forest is described in the 1988 *Plumas National Forest Land and Resource Management Plan*, which was amended by the August 1999 Record of Decision for the final environmental impact statement (EIS) on the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) and the 2004 Record of Decision for the Sierra Nevada Forest Plan Amendment final supplemental EIS. Demographic and economic information for Butte and Yuba Counties has been compiled to provide a baseline for studying socioeconomic impacts of the Slapjack Project. This information is on file at the Feather River Ranger District and available upon request.

3.4.2 Regulatory Framework

The HFQLG Act directs the Secretary of Agriculture to implement a Pilot Project on federal lands in the Plumas National Forest, Lassen National Forest, and the Sierraville Ranger District of the Tahoe National Forest in California. The Pilot Project is designed to maintain ecological integrity, community stability, and forest health. In addition, the Secretary shall use the most cost-effective means in conducting the Pilot Project.

3.4.3 Methodology for Assessing Impacts on Economics

3.4.3.1 Scope of the Analysis

This economic analysis focuses on those revenues and treatment costs associated with implementing group selection and fuel reduction treatments in the Slapjack Project area. The purpose of this economic analysis is to present the potential revenues and costs associated with each of the alternatives for comparison purposes.

This analysis does not include monetary values assigned to resource outputs such as wildlife, watersheds, soils, recreation, visual quality, and fisheries. It is intended only as a relative measure of differences between alternatives based on direct costs and values used. Other values are discussed in the appropriate sections of this document.

3.4.3.2 Analysis Methods

Timber harvest values used in this economic analysis were based on the California State Board of Equalization Timber Harvest Values (January 1, 2005 – June 30, 2005). Harvest costs and road improvement costs were developed from the latest timber sale appraisal values. Mechanical (mastication, grapple pulling), manual (hand cutting, hand piling), and prescribed fire (underburning, pile burning) treatments are based on the latest service contract prices, Knutson-Vandenberg, and brush disposal sale area improvement plans.

3.4.4 Affected Environment (Existing Conditions)

The Plumas National Forest (the Forest) contributes to the regional economy in two primary ways: (1) through the generation of income and employment opportunities for residents of the immediate area, and (2) through direct and indirect contributions to local county revenues. The Forest also contributes in secondary ways, such as through production of goods and services in local and regional markets. Although some economic effects are dispersed over a broad area, the most substantial impacts are felt locally in Butte, Plumas, Lassen, Sierra, and Yuba Counties. The percentage of Plumas National Forest land in local counties is shown in table 3-10.

Table 3-10. Percentage of Plumas National Forest lands by county (based on GIS data).

County	County Acres	Beckworth Ranger District (acres)	Feather River Ranger District (acres)	Mount Hough Ranger District (acres)	Total Plumas National Forest Lands in Each County (acres)	Plumas National Forest Lands within Each County (percent)
Butte	1,072,708	0	143,517	0	143,517	13.4
Lassen	3,022,136	39,686	0	1,635	41,320	1.4
Plumas	1,672,778	448,365	183,210	579,196	1,210,771	72.4
Sierra	615,514	14,794	33,522	0	48,316	7.8
Yuba	411,695	0	33,734	0	33,734	8.2
Totals	**6,794,830**	**502,844**	**393,984**	**580,831**	**1,477,659**	**21.7**

The two employment sectors most related to forest planning processes are the timber industry and tourism. They are very difficult to quantify, in terms of both total employment and their relative importance to local economies, because state and federal employers generally do not break down employment data into these categories.

Forest contributions to local county revenues come from three sources: (1) Payments in Lieu of Taxes, (2) timber yield taxes, and (3) *Receipt Act* payments or payments from the *Secure Rural Schools and Community Self-Determination Act of 2000*. Of these, the *Receipt Act* or *Secure Rural Schools and Community Self-Determination Act* payments are by far the most significant in terms of total contributions to each county and are therefore most likely to be affected by Forest land management decisions.

Payments in Lieu of Taxes. Payments in Lieu of Taxes are administered by the Bureau of Land Management and apply to many different types of federally owned land, including National Forest System lands. Payments in Lieu of Taxes compensate counties for the loss of property tax revenues due to nontaxable federal land in the county. Payments are made annually and are based on local population, federal acreage in the county, and other federal payments during the preceding fiscal year. The minimum payment is 75 cents per entitlement acre. The county may use these funds for any purpose. The Forest has no control over the disbursement of these funds, and the amount disbursed every year is unaffected by Forest land management decisions.

Timber Yield Taxes. The second source of revenues to local government is the timber yield tax, administered by the State Board of Equalization. This tax is not paid by the Forest; instead, it is paid

by private timber operators, based on the amount of timber harvested in a given year on both private and public lands. The tax is 2.9 percent of the value of the harvested timber. The taxes are collected by the state, and approximately 80 percent is returned to the counties from which the timber was harvested. Decisions about the amount of timber to be offered for sale each year on the Forest can affect the amount of revenues disbursed to the counties.

Receipt Act. *Receipt Act* payments are distributed pursuant to the *National Forest Management Act* (Public Law 94-588). Under this law, 25 percent of National Forest revenues are allocated to the state in which the Forest is situated. The amount returned is based on the National Forest acreage within each county. According to state law, *Receipt Act* funds must be divided evenly between public schools and public roads of the county or counties in which the National Forest is located and may not be spent on anything else.

Receipt Act payments are based on 25 percent of the total revenues collected from timber, grazing, land use, recreation, power, minerals, and user fees. Within the 11 western states, however, payments are based on 50 percent of revenue from grazing. Historically, at least 90 percent of total revenues have come from timber sale receipts. As a result, the amount of money available for distribution each year fluctuates widely, depending on the amount of timber harvested on National Forests.

Secure Rural Schools and Community Self-Determination Act. Congress passed the *Secure Rural Schools and Community Self-Determination Act* in 2000, offering counties an alternative to the *Receipt Act*. Under the *Self-Determination Act*, a state's three highest payment amounts between 1986 and 1999 are averaged to arrive at a "compensation allotment" or "full payment amount." A county may choose to continue to receive payments under the *Receipt Act* or to receive its share of the state's full payment amount under the *Secure Rural Schools and Community Self-Determination Act*. National Forests and other federal agencies that contribute to the 25 percent fund would have to generate approximately $56.4 million in total revenues in order to offset the $14 million that the counties receive under the *Secure Rural Schools and Community Self-Determination Act*.

Counties can receive variable, revenue-dependent payments under the *Receipt Act* or receive stable funding for local schools and roads under the *Secure Rural Schools and Community Self-Determination Act*. The legislation promotes local involvement, decisions, and choice by creating well-balanced resource advisory committees that recommend forest projects to the Secretary of Agriculture or advise counties on county project proposals. Counties that elect to receive the full payment amount under the *Secure Rural Schools and Community Self-Determination Act*, and receive more than $100,000, are required to allocate 15 to 20 percent of their funding to projects under Title II or Title III (see table 3-11). Like traditional 25 percent funds, Title I funds are expended for public schools and roads. Title II funds are allocated for projects on federal lands or projects that benefit federal lands. Resource Advisory Committees are established to determine Title II fund distribution. Title III funds are allocated for county projects that include search and rescue, community service work camps, easement purchases, forest-related education opportunities, fire prevention and county planning, or cost-share for urban community forestry projects. The *Secure Rural Schools and Community Self-Determination Act* full payment amounts (fiscal year 2005) for the five counties containing Plumas National Forest lands are shown in table 3-11.

Table 3-11. *Secure Rural Schools and Community Self-Determination Act* full payment amounts to counties for fiscal year 2005.

County	Full Payment Amount	Title I Funds	Title I Percent of Full Payment	Title II Funds	Title II Percent of Full Payment	Title III Funds	Title III Percent of Full Payment
Butte	$895,320	$716,256	80%	$0	0%	$179,064	20%
Lassen	$3,876,372	$3,294,916	85%	$581,456	15%	$0	0%
Plumas	$7,258,972	$6,170,126	85%	$816,634	11%	$272,211	4%
Sierra	$1,848,005	$1,570,804	85%	$92,400	5%	$184,801	10%
Yuba	$238,982	$191,186	80%	$0	0%	$47,796	20%
Total	**$14,117,651**	**$11,943,288**		**$1,490,490**		**$683,872**	

Relative to the local economy, there is a potential to harvest 13–14 million board feet of timber over several years as part of the Slapjack Project. Plumas and Butte Counties can expect to receive 25 percent of the revenues generated from this timber sale through the *Receipt Act* or receive full payment from the *Secure Rural Schools and Community Self-Determination Act*. Approximately 82 percent of the Slapjack Project area is located in Yuba County, and the remaining 18 percent is in Butte County. Employment opportunities would be created from proposed thinning and biomass removal, fuels reduction, site preparation, and planting activities. Furthermore, indirect and induced economic employment and monies would be generated when income received by contractors and the timber industry is re-spent within the local economy.

3.4.5 Economic Consequences

Economic consequences are a measure of the overall value of the seven alternatives considered in this analysis. The level and mix of goods and services available to the public varies by alternative, resulting in a range of impacts on the social and economic environment. The impacts discussed in this section include estimated government expenditures and revenues, as well as monetary impacts on local communities.

Direct monetary impacts are discussed in terms of net cash value to the U.S. Treasury, including the costs associated with implementing the treatments and direct, indirect, and induced job opportunities.

In general, the monetary value of each alternative depends on the amount and method of timber harvest and the acreage planned for fuels reduction treatments. Areas with positive timber harvest values would pay for associated fuels reduction activities on those acres. Fuels reduction treatment costs that exceed harvest revenues would become service contracts to be financed through appropriated funds when available.

The HFQLG final EIS and Record of Decision described the economic impacts of implementing the Pilot Project. This economic analysis does not revisit the information presented in the final EIS and Record of Decision, but for comparison purposes, it focuses only on those revenues and treatment costs associated with each of the alternatives.

Alternative A (No Action)
- No treatments would be implemented.

Alternative B (Proposed Action)
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres), mechanical and manual methods, and prescribed burning

Alternative C
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Alternative D
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds with herbicides (up to 31 acres)

Alternative E
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds without herbicides

Alternative F
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres)

Alternative G
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Employment. Employment opportunities can have direct, indirect, or induced effects on the local economy. Direct effects are associated with the primary producer. For example, the manufacturing of lumber from the Slapjack Project would have a direct effect on employment opportunities. Indirect effects account for employment in service industries that serve the lumber manufacturer. These industries may include logging, trucking, and fuel supplies. Induced effects are driven by wages. Wages paid to workers by the primary and service industries are circulated through the local economy for food, housing, transportation, and other living expenses. The sum of direct, indirect, and induced effects is the total economic impact in terms of jobs, which typically range from 10 to 15 jobs per million board feet of timber harvested.

Revenue to the Government. Net revenue is the difference between the revenues generated by an alternative and the costs required to implement the alternative. In this analysis, revenues come from harvest of timber.

Payments to Counties. Local counties receiving payments through the *Receipt Act* rather than the *Secure Rural Schools and Community Self-Determination Act* would share part of the revenues generated from the timber harvest (refer to table 3-11 above). The actual payment amount depends on estimated stumpage value and the price bid by the purchaser awarded the timber sale contract.

Treatment Costs. Treatment or management costs include those costs associated with timber harvesting, biomass removal, road improvements, fuels treatments, and mitigation measure requirements, as well as costs of resource enhancement measures not associated with the sale of timber. Costs vary widely depending on the amount of mechanical, manual, or thermal treatments prescribed; the board feet of sawlogs or tons of biomass removed per acre; and the accessibility of the treatment units.

Nonpriced Costs and Benefits. It should be noted that all costs and values are not represented in the economic analysis. Calculations do not include costs and values for those items that cannot be estimated in dollar terms. The economic analysis does not take into account nonpriced benefits such as improved long-term wildlife habitat, improved watershed conditions, improved fish passage, control of noxious weeds, and reduced fire hazard. The various habitat improvement opportunities, which are not funded from the project's timber receipts, may be funded through other sources such as watershed improvement needs, Resource Advisory Committees, wildlife habitat improvements, Knutson-Vandenberg, or other appropriated funds. Examples of costs not estimated in dollar terms are the reduction in scenic value in the early years of fuels treatments, air pollution from wildfires, or reestablishing a forest following a stand-replacing wildfire.

For a detailed discussion of these nonpriced benefits and costs, refer to the appropriate resource section in this document. These nonpriced benefits and costs will be considered along with the net economic value of each alternative in order to make a judgment as to which alternative offers the best overall mix of costs and benefits to society.

Table 3-12 summarizes the economic impacts of alternatives A, B, C, D, E, F, and G on the local economy.

3.4.5.1 Alternative A (No Action)

Direct and Indirect Effects. This alternative would not reduce critical fuel loadings or harvest any timber. No funds would be generated for the U.S. Treasury or returned to local counties. No additional employment opportunities or wages paid to primary and service industry employees would be circulated through the local economy.

Table 3-12. Comparison of economic impacts by alternative.

Revenue/Cost/ Employment	Alternatives						
	A	B	C	D	E	F	G
Sawlog and biomass harvest revenues	$0	$3,472,813	$3,472,813	$3,472,813	$3,472,813	$3,428,103	$3,428,103
Timber yield tax	$0	$100,712	$100,712	$100,712	$100,712	$99,415	$99,415
Harvest costs	$0	-$3,051,466	-$3,051,466	-$3,051,466	-$3,051,466	-$2,969,335	-$2,969,335
Net harvest revenues	$0	$421,345	$421,345	$421,345	$421,345	$458,767	$458,767
Nonharvest costs (DFPZ construction)	$0	-$1,091,500	-$1,091,500	-$1,091,500	-$1,091,500	-$1,091,500	-$1,091,500
Direct jobs	0	130	130	130	130	129	129
Indirect jobs	0	130	130	130	130	136	136
Total direct and indirect jobs	0	267	267	267	267	265	265
Total employee-related income	**0**	**$11,476,890**	**$11,476,890**	**$11,476,890**	**$11,476,890**	**$11,411,487**	**$11,411,487**

Cumulative Effects. The no-action alternative would result in a negative effect on local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. These local industries currently lack opportunities related to fuels reduction, site preparation, and timber harvest activities; the action alternatives would provide those opportunities. The local economy would also not receive benefits from associated employment, such as in food, lodging, and transportation businesses. Throughout northern California, cumulative years of reduced timber harvesting activities (including those on federal lands) have resulted in the loss of infrastructure to complete such activities. The loss of such infrastructure, including local mill closures, could significantly reduce or eliminate future economic and environmental opportunities from National Forest lands. The continuation of current conditions under alternative A would preclude opportunities for long-term employment and rural community stability because the fuel reduction activities related to the creation and maintenance of DFPZs would not occur.

Under the no-action alternative, wildlife habitat, meadow, and streambank restoration and enhancement could not take place without appropriated money from Congress. In addition, dense standing trees and down woody material in the Slapjack Project area would continue to pose a very high fire hazard to the surrounding areas. If the no-action alternative were implemented, additional money would be needed to conduct any fuel reduction treatment, as well as possible elevated fire suppression costs should fire reoccur in the Slapjack Project vicinity. Table 3-12 above summarizes the economic impacts of all alternatives on the local economy.

3.4.5.2 All Action Alternatives

Direct and Indirect Effects. Net harvest revenues for thinning and biomass removal would generate $421,345 for alternatives B through E. Net harvest revenue for alternatives F and G would be slightly higher, $458,767. The group selections dropped from alternatives F and G have smaller trees and less volume per acre than the average, thus the value of sawlogs per acre would be higher

under alternatives F and G. This would reduce the impact of harvesting costs (refer to table 3-12). Implementation of mastication, underburning, and other fuel treatments for alternatives B through G would cost $1,091,500. All costs would be the same since no DFPZ treatments were dropped under alternatives F and G. The economic analysis does not take into account nonpriced benefits such as reduced fire hazard.

Thinning, biomass removal, and fuel treatments for alternatives B through E would directly generate 130 full-time employment opportunities, compared to 129 under alternatives F and G. The difference is small because only about 30 acres of group selection were dropped under the alternatives that eliminated non-DFPZ treatments in watersheds that are or would be over the Threshold of Concern. All action alternatives would create additional employment opportunities in service industries (such as logging supply companies, trucking companies, and fuel suppliers) that serve the timber industry. There is also an induced effect that is driven by wages. Wages paid to workers by the primary and service industries would be circulated through the local economy for food, housing, transportation, and other living expenses.

The sum of direct, indirect and induced effects is the total economic impact in terms of jobs. In addition to the direct employment that would result from the harvesting and fuel reduction treatments in alternatives B through G, and the indirect benefits of jobs in sawmills and energy generation plants, there would be some additional benefits to the local economy as wages earned by those employees are spent on living expenses. Alternatives B through E would generate an estimated 267 direct, indirect, and induced jobs, compared to 265 by alternatives F and alternative G.

Cumulative Effects. Each of the action alternatives would result in the same cumulative effect—an increase in the overall economic activity in the HFQLG Pilot Project area. Though not a requirement, it is assumed in this analysis that most products from HFQLG Pilot Projects would be processed locally due to high hauling costs of products and equipment. Likewise, it is also assumed that most employment would largely be derived from Butte, Lassen, Plumas, Sierra, and Yuba Counties. The Slapjack Project timber sale revenues and service contract employment would complement all other HFQLG-funded projects across the forest. The economic goals for the project, as a whole, across the Pilot Project area are discussed in the HFQLG Act final EIS.

See appendix E of this EIS for the complete economic analysis, by alternative.

3.4.6 Summary of Cumulative Effects

This economic analysis for the Slapjack Project is focused on those revenues and treatment costs associated with implementing fuel reduction treatments, group selection, and individual tree selection. Implementation of the no-action alternative would have a negative impact on the local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. If the no-action alternative were implemented, additional funds would be needed to conduct fuel reduction treatments or wildlife habitat, meadow, and streambank restoration.

All action alternatives would provide employment opportunities and generate harvest revenues and timber yield taxes. However, alternatives B through E would generate slightly more harvest

revenue, timber yield taxes, employment opportunities, and employee-related income than alternative F or G (refer to table 3-12 above).

Table 3-13 displays a summary of revenues and costs associated with timber harvest, DFPZ construction, DFPZ preventive maintenance, noxious weed control, and DFPZ long-term maintenance treatments. The project values display the total net revenues or costs for implementing the DFPZ construction and noxious weed control activities. The long-term project values display the total net revenues or costs for implementing the DFPZ construction activities, including the present net value of the DFPZ long-term maintenance activities projected over a 50-year time period. For comparison purposes and to display the cost differences between alternatives, it was projected that alternatives B, E, and F would continue to use herbicides for DFPZ preventive maintenance. Appendix E contains the various spreadsheets used to calculate the revenues and costs for timber harvest, DFPZ construction, DFPZ preventive maintenance, noxious weed control, and DFPZ long-term maintenance treatments.

None of the action alternative would determine how or even if DFPZs would be maintained long term. Decisions regarding the long-term maintenance of the DFPZs would be made at the time such maintenance is determined necessary. At that time, it would be determined whether or not herbicides would be used for DFPZ maintenance. If the woody vegetation and tanoak in the units exceed the height and density threshold set in the DFPZ maintenance guidelines, then some form of mechanical or thermal treatments would be necessary to remove the accumulated fuels. However, if herbicides could be applied without creating additional standing fuels, then herbicides may be used again as a preventive maintenance strategy.

Table 3-13. Summary of revenues, costs, and project value for timber harvest, DFPZ construction, DFPZ preventive maintenance, noxious weed control, and DFPZ long-term maintenance treatments.

Revenue/Cost/ Project Value	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
Direct and Indirect Effects							
Net harvest revenues	$0	$421,345	$421,345	$421,345	$421,345	$458,767	$458,767
DFPZ construction (4,419 ac)	$0	($1,091,500)	($1,091,500)	($1,091,500)	($1,091,500)	($1,091,500)	($1,091,500)
Noxious Weed Control (33 ac x 5 yrs)	$0	($33,020)	($43,140)	($33,020)	($43,140)	($33,020)	($43,140)
DFPZ Preventive Maintenance (1,954 ac)	$0	($488,500)	$0	$0	($488,500)	($488,500)	$0
Total Project Value: Short-Term DFPZ Maintenance	$0	($1,191,675)	($713,295)	($703,175)	($1,201,795)	($1,154,253)	($675,873)
Cumulative Effects							
DFPZ Long-Term Maintenance (50 yrs) (4,419 Ac)	$0	($3,499,930)	($4,337,910)	($4,337,910)	($3,499,930)	($3,499,930)	($4,337,910)
Total Project Value: Long-Term DFPZ Maintenance	?	($4,691,605)	($5,051,205)	($5,041,085)	($4,701,725)	($4,654,183)	($5,013,783)

3.5 Fire And Fuels

3.5.1 Introduction

The Slapjack Project proposes to reduce fire hazards around the rural communities of Brownsville, Challenge, Clipper Mills, Dobbins, Feather Falls, Forbestown, and Strawberry Valley. These communities have been identified as being at risk from wildland fire in Yuba and Butte Counties' Community Wildfire Protection Plans, which were developed through a collaborative effort among state, local, and federal agencies with fire protection responsibilities, and with other interested stakeholders. Fire hazards would be reduced by constructing Defensible Fuel Profile Zones (DFPZs) using a variety of fuel manipulation techniques, such as tree harvest and biomass removal, mastication, manual hand cutting, piling, and burning; and prescribed underburning. Other activities proposed for the Slapjack Project are tree harvesting in the group selection and individual tree selection units in order to achieve an uneven-aged management strategy to regenerate fire-resilient species; associated road system improvement work that will aid fire suppression resources in accessing future wildland fires; and aquatic and wildlife habitat improvement activities near the communities.

3.5.2 Regulatory Framework

The Slapjack Project would contribute to fulfilling the long-term goals of the National Fire Plan of protecting communities at risk from wildfire and restoring ecological health on federal lands. The Slapjack Project would also meet the intent of the 2002 Healthy Forest Initiative by decreasing the wildfire risk to people, communities, and the environment through the construction of DFPZs, and increasing firefighter safety through improved road systems to access wildfires. DFPZs also provide safe areas to initiate fire suppression activities in the event a fire starts outside of the DFPZ.

The Slapjack Project is designed to fulfill management direction as specified in the 1988 *Plumas National Forest Land and Resource Management Plan* (the "Forest Plan"), as amended by the 1999 Record of Decision on the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) final environmental impact statement (EIS) and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS. The standards and guidelines for fuels and vegetation management activities for the Slapjack Project area are shown in table 2 of the 2004 SNFPA Record of Decision. Table 2 includes direction for designing and implementing fuel and vegetation management activities in each of the various land allocations of the HFQLG Pilot Project.

The Feather River Ranger District has been working in conjunction with the Fire Safe Councils in Yuba and Butte Counties to design and implement fuel reduction projects on private lands, with the intent of improving connectivity of fuels treatments in the Slapjack Project area. There are currently two projects (funded under Proposition 40) on private lands in the Slapjack Project area. The Yuba and Butte Fire Safe Councils are currently working with private land owners to receive funds from Proposition 40 and other grant opportunities in fiscal year 2006 to complete more fuels reduction work within the Slapjack Project area.

3.5.3 Methodology for Assessing Impacts on Fire and Fuels

3.5.3.1 Scope of Analysis

The Slapjack Project area forms the analysis area for the pre- and post-treatment fire behavior predictions and for the fire regime condition class analysis. For analysis of both direct and indirect effects, a period of 5 to 20 years is estimated as the amount of time the treatments would remain effective following treatment, depending on vegetation type (see the "Vegetation" section (3.12) for more discussion of treatment effectiveness). The Slapjack Project area would comprise approximately 34,725 acres of public and private land and would generally be situated between Lake Oroville to Dobbins on the west, the North Yuba River to Wambo Bar on the east, and from Barton Hill to the town of Feather Falls to the north. The geographic area of analysis for cumulative effects extends to the adjacent areas within 1 mile of the Slapjack Project area. The time frame for the cumulative effects analysis is from 1989 to approximately 2011. The analysis area for fire history includes the six 6th-level watersheds that encompass the Slapjack Project area. The six watersheds used in this analysis are Frey Creek, Ponderosa Reservoir, New Bullard's Bar, McCabe Creek, Lower Dry Creek, and Dobbins Creek. These six watersheds and the time period between 1917 and 2003 make up the analysis area for fire history. Fires in this analysis area could logically burn into or affect the project area. Past fires in the analysis area were inventoried and used to calculate fire size and fire causes. It is understood that this data does not contain all of the fires that actually occurred. The missing data can be due to a lack of reporting, differing priorities over the decades, and loss of records.

3.5.3.2 Indicators

Two environmental indicators were analyzed in this "Fire and Fuels" section: fire behavior and fire regime / condition class.

3.5.3.3 Analysis Method

Fire Behavior. The fire behavior measures used in evaluating the pre- and post-treatments are flame length, fire type, tree mortality, fuel loading, and canopy base height. Definitions for many terms used in this EIS can be found in the "Glossary" at the back of this document.

The predicted fire behavior in the proposed treatment units can be described by modeling both the current conditions in each of the units (based on stand and unit-level site-specific information) and the conditions that would result from implementation of the different alternatives. The fire behavior predictions are based on the Fire Program Solutions Fire Management Analyst (FMA 2002), a fire behavior program that uses algorithms to display rate of spread, flame lengths, crown fire initiation, crown fire type, and probability of tree mortality. The fuel models used in FMA 2002 simplify complex fuel profiles, which in turn simplify the predicted fire behavior; however, these fire behavior descriptors are useful in illustrating the relative differences among the alternatives.

Of the units analyzed, 10 percent of the proposed treatment units were selected to show pre- and post-treatment fire behavior for the analysis of effects. These units were selected based on proximity to communities at risk, elevation, and proposed treatment for each unit, fuel type, and sensitive habitat. The results of all data runs are contained in the Slapjack Project file, available for viewing at the Feather River District Office.

Site-specific vegetation characteristics were extracted from Forest Inventory Analysis data and entered into the FMA. The current National Forests Fire Laboratory (NFFL) fuel models were determined from on-the-ground evaluation of the areas proposed for treatment. The NFFL fuel models 8 and 9 were used for all post-treatment fire behavior analysis. This determination was made based on the experience of Brooks Henderson (District Fire Management Officer), who has 27 years of fire experience in the area. Mr. Henderson has observed that fire behavior after the type of treatments proposed are best represented by fuel models 8 and 9, depending on short- or long-needle type and canopy cover (Henderson, pers. comm. 2005).

The 90th percentile weather conditions (see table 3-14) are standard weather parameters used for fire behavior prediction modeling on the Plumas National Forest. The data used in calculating the 90th percentile weather conditions were derived from the Pike County Remote Automated Weather Station (RAWS) located on the Feather River Ranger District. The use of 90th percentile weather conditions simplifies the modeling outputs of a complex environment and does not take into account the increase in wind speed that is often associated with large fires. The Pike County RAWS location is approximately the same in elevation and vegetation type as the proposed Slapjack Project.

Table 3-14. 90th percentile weather conditions and observations.

Weather Parameter	Observations
Dry bulb	92ºF
Duff	60 percent
Relative humidity	14 percent
1-hour fuel moisture	4 percent
10-hour fuel moisture	5 percent
100-hour fuel moisture	7 percent
1,000-hour fuel moisture	8 percent
20-foot wind speed	7 mph
Herbaceous fuel moisture	33 percent
Live woody fuel moisture	48 percent
Live fuel moisture	120 percent

Historical Fire Regime and Condition Class. The historical fire regime determination was made by analyzing fire history for the watersheds described above in the “Scope of Analysis” section, and reviewing fire history research that is relevant to this project. Individuals trained in evaluating fire regime and condition class determined the current condition class through observations of the vegetation and fuel composition characteristics in the project area and comparing their observations to a course-scale condition class map that was developed jointly by Forest Service Region 5 and the California Department of Forestry. The following discussion describes the fire regime and condition class concept.

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but it also includes the influence of aboriginal burning (Agee 1993; Brown 1995). Coarse-scale definitions for natural (historic) fire regimes have

been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The five historical fire regimes are classified based on the average number of years between fires (fire frequency), combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. Table 3-15 shows that historical fire regimes are described by a five-tiered system, which ranks fire regimes by frequency and severity.

Table 3-15. Historical fire regimes.

Rank	Frequency	Severity
Fire Regime 1	0–35 years	Low
Fire Regime 2	0–35 years	Stand replacement
Fire Regime 3	35–100+ years	Mixed
Fire Regime 4	35–100+ years	Stand replacement
Fire Regime 5	200+ years	Stand replacement

A fire regime condition class (FRCC) is a classification of the amount of departure from the natural fire regime (Hann and Bunnell 2001). Coarse-scale FRCC classes have been defined and mapped by Hardy et al. (2001) and Schmidt et al. (2002) and include three condition classes for each fire regime. The classification is based on a relative measure describing the degree of departure from the historical natural fire regime. This departure results in a change to one or more of the following ecological components: vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated disturbances. Condition classes can be altered by disturbances such as timber harvest, livestock grazing, introduction of noxious weeds (nonnative plant species), introduction of insects, and other types of natural phenomena such as wind or water. The condition classes are described below.

- **Condition Class 1:** Fire regime is within the historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within the historical range.

- **Condition Class 2:** Fire regime has been moderately altered from the historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical ranges by one or more return intervals (either increased or decreased). This would result in moderate changes to one of the following: fire size, intensity, severity, and landscape patterns. Vegetation has been moderately altered from the historical range.

- **Condition Class 3:** Fire regime has been significantly altered from the historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals, resulting in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.

Fire regime and condition class are interlinked. For example, a recently burned area classified as Fire Regime 1 would most likely be in Condition Class 1, meaning the area is within its historical range of variability. Another example would be a Fire Regime 1 area that has not burned within

100 years, meaning that it has missed at least two natural fire disturbances. In this example, the area would most likely be classified as Condition Class 2 or 3.

3.5.4 Affected Environment (Existing Conditions): Fire and Fuels

3.5.4.1 Fire Regime Condition Class

Fire History. The Feather River Ranger District has detailed information on fire ignitions since 1965, but only limited information is available for fires before that time. The history of large fires was derived from the Plumas National Forest Geographic Information System (GIS) database that tracks both Forest Service and California Department of Forestry large fires from 1917 to 2003. It is understood that this data does not contain all of the fires that actually occurred due to such reasons as lack of reporting, differing priorities over the decades, or loss of records. However, there is enough data to demonstrate the continuing influence of wildland fire in and surrounding the approximate 34,725-acre Slapjack Project area. Watersheds were used for this analysis based on the different types of fuels that are found in the watersheds and where large fires have the ability to burn entire watersheds.

The Forest Service did not begin taking organized and consistent fire suppression action until the 1920s. Before that time, fires on National Forest System lands burned unconstrained regardless of cause, unless they were a threat to private property. Fires burned with varying intensity (usually low) and often burned large swaths of land before they were extinguished by weather or lack of fuel. Random fire occurrences maintained dead fuels and stand structures in conditions that were more resistant to stand-replacing fires. These stand conditions have been documented by pioneer accounts, early photo point records, and fire history records from tree ring analysis.

An analysis of the project area and immediate surroundings indicates that fire continues to influence the landscape. Records of large fires between 1917 and 2003 show a total of 58 fires that affected or could have affected the Slapjack Project area. Large fires ranged from 100 acres to over 33,000 acres in size, the largest being the “49er” fire that burned over 33,000 acres and destroyed 148 dwellings and 356 other structures. See table 3-16 for a U.S. Forest Service detailed fire history of class A, B, C, and D fires listed by watershed and fire cause.

Table 3-16. Fires greater than 100 acres that occurred between 1917 and 2003.

Year	Cause	Total Fire Size (acres)	Year	Cause	Total Fire Size (acres)
1917	Unknown	700	1931	Unknown	230
1917	Unknown	8,000	1932	Unknown	573
1918	Unknown	705	1932	Unknown	168
1920	Unknown	378	1934	Unknown	268
1920	Unknown	246	1934	Unknown	212
1920	Unknown	574	1934	Unknown	168
1920	Unknown	236	1936	Unknown	159
1920	Unknown	340	1936	Unknown	544

Table 3-16. Fires greater than 100 acres that occurred between 1917 and 2003 (continued).

Year	Cause	Total Fire Size (acres)	Year	Cause	Total Fire Size (acres)
1921	Unknown	682	1937	Unknown	195
1921	Unknown	1,000	1942	Unknown	1,002
1926	Unknown	793	1944	Unknown	632
1926	Unknown	548	1948	Miscellaneous	335
1927	Unknown	164	1949	Lightning	256
1927	Unknown	206	1949	Miscellaneous	239
1927	Unknown	27,829	1949	Lightning	772
1928	Unknown	142	1959	Miscellaneous	18,514
1928	Unknown	503	1960	Miscellaneous	5839
1929	Unknown	114	1960	Unknown	4,364
1929	Unknown	524	1961	Unknown	578
1929	Miscellaneous	135	1961	Unknown	1,471
1929	Unknown	746	1977	Miscellaneous	163
1929	Unknown	4,063	1988	Human	33,000
1930	Unknown	157	1994	Unknown	301
1931	Unknown	238	1997	Miscellaneous	5,835
1931	Unknown	2,698	1999	Miscellaneous	12,289
1931	Unknown	1,901	1999	Lightning	1,784
1931	Unknown	121	2002	Human	187

Table 3-17 shows that fires ignited in the project area are more likely to be ignited by human causes rather than natural causes.

Table 3-17. Number of fires by watershed and fire cause (1965–2003).

Cause	Frey Creek	Ponderosa Reservoir	New Bullard's Bar	McCabe Creek	Lower Dry Creek	Dobbins Creek	Total
Campfire	3	1	2	1	3	0	10
Lightning	2	6	19	2	7	1	37
Equipment use	2	3	7	2	7	0	21
Smoking	3	7	9	0	3	0	22
Children	1	6	2	0	9	0	18
Debris burning	2	7	12	1	8	1	31
Railroad	0	0	0	0	0	0	0
Incendiary	2	5	11	2	10	0	30
Miscellaneous	2	17	26	1	27	0	73
Total	**17**	**52**	**88**	**9**	**74**	**2**	**242**

In the Sierra Nevada, fire regimes varied historically across the landscape with elevation, precipitation, aspect, topographic position, soil conditions or site productivity, and vegetation (Skinner and Chang 1996; Fites-Kaufman 1997).

Fire patterns can vary by individual watershed or landscape, even if they have similar vegetation. For example, the role of fire can vary with how the landscape is oriented relative to prevailing wind patterns. Drainages that are aligned with prevailing wind patterns will have more frequent, or larger, or more intense fires than those that are sheltered from prevailing winds. However, rarely is there fire history data for each landscape, so generalizations on fire regimes are often made based on similarities in the landscape topography and vegetation. For the northern Sierra Nevada, fire history research has been compiled from all parts of the Sierra Nevada and southern Cascade Mountains by vegetation type and landscape conditions to allow the Forest Service to describe general historic fire regime patterns for the northern Sierra Nevada.

According to Fites-Kaufman, in the northern Sierra Nevada, elevation is the most important and visible factor underlying changes in fire regimes and vegetation. The Slapjack Project would lie within what Fites-Kaufman describes as the lower montane zone, which ranges from approximately 2,000 feet in elevation to approximately 4,500 to 5,000 feet in elevation. This zone is characterized by ponderosa pine, black oak, and live oak forest, with interspersed chaparral in the lower elevations of the zone. In lower elevations (less than 3,000 feet), Douglas-fir has been seen in riparian areas and on wetter north aspects. Historically, fire return intervals in this zone ranged from 5 to 15 years, with low fire intensity and severity resulting from small accumulations of fuels on the ground due to the frequent fire return interval.

Chang and Skinner (1996) describe a mixed conifer zone, which lies within the middle elevation zone of the Sierran forest and is dominated by ponderosa pine, with large amounts of white fir and sugar pine. Variation in species is usually associated with elevation. Generally, this mixed conifer zone, like Fites-Kaufman's lower montane zone, is described as having frequent fires of low to moderate severity. However, it was found that the fire regime could vary in both interval and severity depending on vegetation, topographic position, site quality, and other local factors.

The Slapjack Project area is characterized as a mixed conifer forest type, with a heavy component of tanoak. The area receives high annual precipitation that ranges from 60 to 80 inches per year. The median fire return interval in a study conducted by Wills and Stuart (1994) in mixed evergreen forest near the Forks of the Salmon was 15 years, with a range of 3 to 50 years. In another study conducted by Agee (1993), the mean fire return interval was 18 years in mixed conifer-tanoak near Oregon Caves National Monument.

3.5.4.2 Summary of Fire Regime and Condition Class Affected Environment

Fire Regime. Historically the Slapjack Project area fell within Fire Regime 1, meaning it has a frequent fire return interval of 0 to 35 years, with a low to moderate fire intensity and severity.

Condition Class. The majority of the project area is made up of Fire Regime 1, Condition Classes 2 and 3, meaning that the fire return interval for the area is approximately 0 to 35 years, and stand-replacing fires can be expected. Condition classes 2 and 3 indicate that the Slapjack Project area

ecosystem is at a moderate to high risk of losing key ecosystem components as described above. The percentage of acres of Slapjack Project area by condition class is as follows: Condition Class 1, 4 percent; Condition Class 2, 24 percent; and Condition Class 3, 70 percent. The remaining 2 to 3 percent of the area is unburnable, meaning it is made up of water, rock out cropping, or other natural or man-made barriers that will not sustain combustion.

3.5.4.3 Fuels and Fire Behavior

A mixed conifer-pine forest dominates the Slapjack Project area. The mixed conifer forest type consists of the following tree species: ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*), sugar pine (*Pinus lambertiana*), incense-cedar (*Calocedrus decurrens*), Douglas-fir (*Psuedotsuga menziesii*), California black oak (*Quercus Keloggii*), California live oak (*Quercus agrifolia*), and tanoak (*Lithocarpus densiflora*). Assorted shrub species of *Ceanothus* (*Ceanothus* sp.), manzanita (*Arctostaphylos* sp.), bear clover (*Chamaebatia foliolosa*), California blackberry (*Rubus ursinus*), and Himalayan blackberry (*Rubus discolor*) contribute to the dense understory of the project area. Three noxious weeds (invasive plant species) that contribute to wildfire threat in the project area are Scotch broom (*Cytisus socpaarius*), Spanish broom (*Spartinum junceum*) and French broom (*Genista monspessulana*).

Many of today's forests have been altered from their historic conditions, especially in the mixed conifer vegetation type. Timber harvest, including clear cutting and high grading (taking only the largest and most valuable trees); grazing; fire suppression; and intense large fires have changed the forest structure and species composition of mixed conifer forest. This is the case for the Slapjack Project area. Current conditions in the majority of the project area include a reduction of large trees and structural diversity and an overstocked understory made up of shade-tolerant species such as incense-cedar, white fir, tanoak, and brush. There has been a shift towards increased proportions of shade-tolerant, less fire-adapted species (firs and incense-cedar) and decreased proportions of shade-intolerant, fire-adapted species such as large pines. Many areas are overstocked and, as a result, susceptible to disease and insect attack.

Fuel conditions in the Slapjack Project area were calculated using ArcView 3.3 from data stored in the Plumas National Forest GIS library and ground-truthed with personal observation. Fuel conditions are variable throughout the Slapjack Project area and can be described by six Northern Forests Fire Laboratory fuel models (FM): FM 10, mixed conifer with heavy timber litter and a dense shade-tolerant understory, comprises approximately 44 percent of the area; FM 9, described as closed canopy stands of long-needle conifers or hardwoods, comprises approximately another 23 percent of the area; brush FMs 4, 5, and 6 make up 27 percent of the project area; and FM 8, closed canopy stands of short-needle conifers, comprises 3 percent of the area. The remaining 3 percent is made up of water or other natural or man-made noncombustible materials. Fuel Models 8 and 9 represent desired fuel conditions.

Fuel Model 4 describes stands of mature shrubs, 6 or more feet in height, that have a higher percentage of dead fine woody material in the crowns of the shrubs than other brush fuel models. Fires can burn with high intensity and rapid rates of spread due to the higher percentage of dead woody material associated with this fuel model. A deeper litter layer may also hamper suppression efforts in this fuel model.

Fuel Model 5 represents shrub and sapling fuel types, which are indicative of some type of disturbance. Fires generally are not intense due to the low surface fuel loadings. Only under late summer conditions and/or extreme weather condition do live fuels in FM 5 pose a threat of becoming large fires.

Fuel Model 6 contains a wide range of shrub conditions. Shrubs may be older in FM 6 than FM 4 but may not be tall and/or have the dead woody component seen in FM 4. Fires may carry better through FM 6 than FM 5; however, a moderate wind (greater than 8 mph) is required. Fires will drop to the ground in lesser wind speeds or at openings in the stand.

Fuel Models 8 and 9 are single-story, early-to-mid successional stands with little dead and down material or ladder fuels. Fires burn with low intensity with little spread or tree mortality. Initial attack in these fuel types is highly successful. Only under extreme fire conditions (such as high wind speeds) do these fuel types pose a resistance to control.

Fuel Model 10 represents decadent late-stage succession, characterized by multistoried stands with ladder fuels and a significant component of dead and down materials. Due to the heavy down fuel component and presence of ladder fuels, fires in FM 10 burn with a high intensity. This can lead to spotting, torching, and crowning in overstory trees. Fires occurring in this fuel type are difficult to control under initial attack conditions.

3.5.4.4 Topography

The slopes in the Slapjack Project area vary considerably, ranging between 0 and 65 percent. The majority of the group selection units would be located on slopes between 0 and 35 percent. Elevation in the project area ranges from approximately 2,500 feet to 4,000 feet in elevation.

3.5.4.5 Desired Fire and Fuels Conditions

Desired fuels conditions are described in the 1988 Forest Plan, as amended by the 1999 Record of Decision on the HFQLG Act final EIS and the 2004 Record of Decision on the SNFPA final supplemental EIS. Consistent with these desired conditions, the proposed action would reduce existing surface and ladder fuels in the DFPZs, group selection units, and individual tree selection units. Residual fuels (less than 3 inches in diameter) in these treatment areas would not exceed 5 tons per acre post treatment. However, where down logs exist, 10 to 15 tons per acre of the largest down logs, having diameter greater than 12 inches, would be retained. Ladder fuels would be removed in the treatment units to increase canopy base heights, which would prevent convective heat from igniting tree crowns. In general, canopy cover would be reduced to approximately 40 percent to reduce the potential for crown fire spread and allow for more effective application of water and fire retardant by aerial suppression resources in the event of a wildfire. Other desired conditions are flame lengths less than 4 feet and a decrease in resistance to control during initial attack. This change would help to moderate fire behavior within the DFPZs, group selection units, and individual tree selection units.

The proposed treatments would also be implemented in the riparian areas within DFPZs in order to enhance and protect the riparian areas from effects of large wildland fires. To create desired

conditions, some hand cutting, piling, and burning of piles could be considered. This type of treatment would be used if the post-thinning review of the area determines that it would be beneficial to the health of the riparian areas to do so. All of these types of treatments are designed to improve the health and fire resiliency of the riparian areas.

3.5.5 Environmental Consequences

3.5.5.1 Alternative A (No Action): Fire Behavior

Flame Length. The upper limit for direct action taken by hand crews is generally considered to be 4 feet, and 6 feet is considered the upper limit for direct action taken by mechanized equipment (dozers). Flame lengths in excess of these limits usually result in indirect action taken to contain the fire. The no-action alternative would reduce the effectiveness of hand crews used for fire suppression. Flame length predictions for both the current condition and the post-treatment conditions are described in table 3-18.

Table 3-18. Flame length predictions for current conditions and post-treatment conditions.

Treatment Unit	Alternative A: No Action (Current Conditions)			Action Alternatives (B, C, D, E, F, and G)		
	Fuel Model[a]	20% Slope	40% Slope	Fuel Model[b]	20% Slope	40% Slope
20	5	6 feet	7 feet	9	2 feet	3 feet
40	10	3 feet	4 feet	9	3 feet	3 feet
51	10	6 feet	7 feet	8	1 foot	1 foot
59	10	5 feet	6 feet	8	1 foot	1 foot
61	10	6 feet	7 feet	9	2 feet	3 feet
62	9	3 feet	3 feet	9	3 feet	3 feet
75	9	3 feet	3 feet	9	3 feet	3 feet
80	5	6 feet	7 feet	9	2 feet	3 feet
97	5	6 feet	7 feet	8	1 foot	1 foot
184	10	3 feet	4 feet	8	3 feet	4 feet
991	11	2 feet	3 feet	8	1 foot	1 foot

Notes:

a. Fuel model used for existing condition analysis.

b. Fuel model used for post-treatment analysis.

Fire Type. Fire type is described in four ways. The first type is a surface fire, which burns only the fuels at or near the surface without torching the trees above—this is the desired condition. The second type is the passive crown fire, which torches out individual or small groups of trees as the surface fuels burning under them provide the convective heat to ignite the above-ground fuels. The third is the active crown fire in which fire is spread from tree to tree in conjunction with the convective heat of the surface fuels burning under them. The fourth is the running crown fire—this is a very rare occurrence in which the fire is spread from tree to tree independent of the burning surface fuels. This type of crown fire requires extreme weather conditions and contiguous heavy tree canopy and is not modeled for. The no-action alternative would allow wildland fires to develop into either passive or active crown fires. Fire type predictions for both the current condition and post-treatment conditions are described in table 3-19.

Table 3-19. Fire type predictions.

Treatment Unit	Alternative A: No Action (Current Conditions)		All Action Alternatives (B, C, D, E, F, and G)	
	20% Slope	40% Slope	20% Slope	40% Slope
20	Active	Active	Surface	Surface
40	Active	Active	Surface	Surface
51	Passive	Passive	Surface	Surface
59	Passive	Passive	Surface	Surface
61	Active	Active	Surface	Surface
62	Passive	Passive	Surface	Surface
75	Surface	Surface	Surface	Surface
80	Passive	Active	Surface	Surface
97	Passive	Passive	Surface	Surface
184	Passive	Active	Surface	Surface
991	Active	Active	Surface	Surface

Tree Mortality. The *probability of mortality* is the chance that a tree will be killed by a fire. Probability of mortality is based on bark thickness and percent crown scorched, which is derived from scorch height, crown ratio, tree height, species, and tree diameter (FMA 2002). Probability of mortality was averaged for the treatment units analyzed.

Tree mortality predictions for both the current condition and the post-treatment conditions are described in table 3-20.

Table 3-20. Percent probability of pre- and post-fire tree mortality.

Treatment Unit	Alternative A: No Action (Current Conditions)		All Action Alternatives (B, C, D, E, F, G)	
	20% Slope	40% Slope	20% Slope	40% Slope
20	82%	86%	7%	8%
40	69%	75%	9%	10%
51	67%	78%	6%	6%
59	68%	69%	5%	5%
61	65%	69%	4%	4%
62	52%	54%	6%	7%
75	68%	70%	68%	70%
80	87%	87%	18%	10%
97	40 %	47%	6%	6%
184	57%	70%	48%	48%
991	55%	56%	2%	2%

The probability of mortality was calculated for a subset of trees with diameters between 10 and 29 inches. It was predicted that in the event of a wildland fire (under 90th percentile weather conditions) under the no-action alternative, there would be approximately 24 percent mortality of mixed conifer trees between 10 and 29 inches diameter breast height (dbh) on 40 percent slopes, and 19 percent mortality on 20 percent slopes.

The probability of mortality by tree species, diameter at breast height, tree height, and crown ratio for inventoried stand data is available for viewing in the Slapjack Project file at the Feather River District Office.

Fuel Loading. Fuel load and depth are significant fuel properties for predicting whether a fire will be ignited, its rate of spread, and its intensity. Fuel loading can slow the suppression efforts of firefighters if there are large accumulations of dead and down fuel. Fuel loading predictions for both the current conditions and post-treatment conditions are described in table 3-21. Table 3-22 reflects initial attack production rates, by fuel type.

Table 3-21. Fuel loading predictions at less than 3 inches.

Treatment Unit	Alternative A: No Action Current Conditions	Alternatives B, C, D, E, F, and G
	Tons per Acre	
20	3.50	3.48
40	8.41	4.53
51	15.62	3.50
59	12.02	5.00
61	15.62	3.48
62	4.53	4.53
75	4.53	4.53
80	3.50	3.48
97	3.50	3.50
184	8.41	6.51
991	6.50	5.00

Table 3-22. Estimated initial attack production rates.

Crew Type	Fuel Mode 5	Fuel Model 10	Fuel Model 11	Fuel Model 9	Fuel Model 8
	Chains per Hour[a]				
Type 1 Crew 20 person	6	20	15	40	40
Type 3 Engine 5 person	20	20	20	22	24

Source: Fireline Handbook NWCG Handbook 3, 1998.

Note:

a. Chain is a measurement of distance; one chain = 66 feet.

Canopy Base Height. For the purpose of this analysis, canopy base height is the height above the ground of the first canopy layer where the density of the crown mass within the layer is high enough to support vertical movement of a fire. Ladder fuels would be removed in the treatment units to increase canopy base. Conditions under the no-action alternative would allow surface fires to move into the crowns. Canopy base height predictions for both the current condition and the post-treatment conditions are described in table 3-23.

Table 3-23. Canopy base height.

Treatment Unit	Alternative A: No Action Current Conditions (in feet)		Action Alternatives B, C, D, E, F, and G (in feet)	
	20% Slope	40% Slope	20% Slope	40% Slope
20	2	2	51	51
40	2	2	N/C[a]	N/C
51	3	3	52	52
59	2	2	N/C	N/C
61	2	2	N/C	N/C
62	2	2	N/C	N/C
75	25	25	34	34
80	2	2	42	42
97	2	2	N/C	N/C
184	2	2	19	19
991	1	1	98	98

Note:

N/C = Noncomputable – minimal canopy bulk density does not allow the FMA program to compute this calculation.

3.5.5.2 Alternative A: Condition Class

The Slapjack Project area would remain mostly in Condition Classes 2 and 3 and have a moderate to high risk of losing key ecosystem components because the vegetation characteristics and fuel composition would not change under alternative A.

3.5.5.3 Alternative A: Effects of No Action

Direct Effects – Fire Behavior. Surface fuels, ladder fuels, and canopy fuels would not be modified over the short term; therefore, potential fire behavior would not change from the current condition. Fires would be expected to be more intense, resulting in a greater percentage of tree mortality.

Direct Effects – Fire Suppression. Road closures, reconstruction, and decommissioning would not occur; therefore, access for fire suppression resources would not be modified from current levels into the near future, which may slow the suppression efforts of firefighters.

Indirect Effects – Fire Suppression. An increased intensity of wildfire (as described above in the "Fire Behavior" section) and longer initial attack response time for fire suppression resources would increase the likelihood that fires could escape initial attack and become large. Larger fires would increase the risk of injuries to both firefighters and the public, as well as increase the potential for residences to be lost or damaged. As reported by van Wagtendonk (2004), there are landscapes today where accumulations of dead woody debris and dense stands of shade-tolerant understory trees and shrubs have made the fuel and vegetation complex nearly homogeneous (same kind of vegetation structure or species), and that the inevitable fire that cannot be suppressed becomes larger and burns more intensely. The potential for high-intensity fire exists in the Slapjack Project in those areas where there is little heterogeneity (diversity) in the fuel and vegetation complexes.

Riparian/Forest Cover – High-intensity wildfires can cause substantial loss of forest cover and degrade watersheds and riparian areas. Areas that experience high-intensity wildfires often take longer to regenerate because of high local seed mortality and the great distance seed sources are from burned areas (Graham, McCaffrey, and Jain 2004).

Forest Health – Additional tree mortality may be caused by increased insect attacks following a wildfire. The no-action alternative would produce indirect effects in that hazardous fuels would continue to build up. Dead fuels and shaded forest floors would inhibit natural regeneration of fire-tolerant tree and plant species.

Cumulative Effects. See section 3.5.6 below for a discussion of past, present, and reasonably foreseeable future actions considered in the cumulative effects analysis. Taking no action would not provide connectivity with the Lower Slate and South Fork DFPZs on adjacent National Forest System lands and privately owned lands (see "Figure A-5b: Slapjack Project Connectivity with Private Lands" in appendix A). Future Forest Service fuel reduction projects, as well as those currently being designed by the Fire Safe Councils in Butte and Yuba Counties, would lack connectivity without the larger landscape-scale design proposed for the Slapjack Project. Even though DFPZ effectiveness is not conclusive, and has not been established at the landscape scale (Agee et al. 2000), the Slapjack Project is part of the HGQLG Act Pilot Project that is intended to evaluate the effectiveness of DFPZs.

Summary of Effects. The no-action alternative would not meet the intent of the 1988 *Plumas National Forest Land and Resource Management Plan*, as amended by the 1999 Record of Decision on the HFQLG Act final EIS and the 2004 Record of Decision on the SNFPA final supplemental EIS, the National Fire Plan, or the Healthy Forest Initiative. Rural communities would continue to be at risk from wildfire, and public and firefighter safety would continue to be jeopardized from the existing conditions in the event of a wildfire.

3.5.5.4 All Action Alternatives: Effects of DFPZs, Group Selection, and Individual Tree Selection Harvests

Direct Effects – Fire Behavior. The potential fire behavior would be decreased in the treatment units by all action alternatives when compared to the no-action alternative. The most effective strategies for reducing crown fire occurrence and severity are to (1) reduce surface fuels, (2) increase height to live crown, (3) reduce canopy bulk density, and (4) reduce continuity or density of the forest

canopy (Graham, McCaffrey, and Jain 2004; Peterson et al. 2005). Flame lengths could be reduced from 2–7 feet to 1–4 feet by reducing surface fuels through underburning, piling and burning, or mastication. Fuel loading would be reduced by more than 57 percent across all units. These results indicate that acres inside the treatment units would meet the standards and guidelines of the 1999 Record of Decision on the HFQLG Act final EIS. Unit 184 is the only unit that would not meet the post-treatment 5 tons/acre standard required by the 1999 Record of Decision. Unit 184 is an underburn-only unit because it contains the Sensitive plant species, Layne's butterweed (*Senecio layneae*). It is important to note that units with underburn may not reach the desired condition with only one treatment and would require a follow-up underburn within two to five years of the first, if the desired condition is not reached. The proposed treatments of hand and mechanical thinning, biomass removal, and mastication would increase canopy base height in most of the units from 1 to 3 feet to over 19 feet. The reduction in fuel loading and increase in canopy base height, combined, would decrease the likelihood that surface fires would develop into crown fires. In the event of a wildland fire under the 90th percentile weather conditions, there would be approximately 9 percent mortality of mixed conifer trees between 10 and 29 inches dbh on slopes between 20 percent and 40 percent.

For the most part, these potential fire behavior characteristics would be expected immediately after final treatment is complete and would last anywhere from 5 to 20 years. The "Vegetation" section (3.12) in this chapter contains a discussion on how long the effects of the proposed treatments are expected to last on the different vegetation components.

Direct Effects – Fire Behavior and Microclimate. The following is a discussion about the potential increase in fire behavior due to changes in microclimate and increases in fine fuels (Demming et al. 1977; Weatherspoon 1996; Agee et al. 2000) in the treatment units. Because of the increased tree spacing and decreased shade from tree canopies, the action alternatives would create slightly hotter and drier conditions and slightly increased wind speeds in the DFPZs and group selection units. The open canopy would also encourage more fine fuels and herbaceous plants. However, when all the effects (reductions in surface fuels, flame lengths, and ladder fuels and an increase in fire suppression production rates) of the treatments are considered together, the fuel treatment activities would mitigate the effects caused by the decreased relative humidity and increased temperature (Martin and Brackebusch 1974; Rothermel 1983; Agee 1996; van Wagtendonk 1996; Agee et al. 2000). Residual canopy cover within DFPZ units would effectively keep fuel in a sheltered or partially sheltered forest. In the group selection units, the existing canopy of trees surrounding the group selections would mitigate any increase in wind speed. The proposed groups would average 1.5 acres in size. In an opening that small, an increase in wind speed would hardly be noticeable to a person standing in the unit.

Direct Effects – Fire Behavior and Shrubs. Research on group selection patches in the Challenge Experimental Forest (located in the project area) indicates that, in 10 years, there will be significant cover of grasses, herbs, and shrubs, but that the vegetation will have achieved little height growth (McDonald and Abbott 1994; McDonald and Reynolds 1999). That research shows that small openings, characteristic of group selection, suppressed growth of shrubs due to shading from trees adjacent to the openings (McDonald and Abbott 1994; McDonald and Reynolds 1999). The live fuel moisture of the grasses, herbs, and shrubs will play the biggest role in reducing fire behavior (Agee 1996) in addition to the ratio of live:dead vegetation available to burn. The proportion of dead and

live material in the units may affect the way regenerated shrub species may burn. With a relatively low amount of dead surface fuels (5 tons or less per acre) remaining post treatment, the live fuels in the group selection units may act more as a heat sink rather than a heat source in the event of a wildland fire. It has been observed on the Plumas National Forest, that brush species do not exhibit severe or extreme fire behavior, especially when the brush is young, succulent, and growing. On the Plumas National Forest, one example of a high-intensity wildfire burning into an older plantation with a heavy brush component occurred when the Pigeon fire in August 1999 (Mount Hough Ranger District) burned to the edge of a plantation where the spread was limited by the fuel characteristics in the plantation. Spot fires in the plantation also had limited spread because of the fuel characteristics (Phil Shafer, pers. comm.). Another example was the Mosquito fire in August 1999 (Feather River Ranger District) that started from a lightning strike adjacent to a nine-year-old plantation comprised mainly of ponderosa pine with a high component of *Ceanothus* shrubs—much like many of the plantations in the Slapjack Project area. A fireline was quickly constructed through the middle of the plantation, and the fire was controlled at about 30 acres by one engine crew and a dozer. If the *Ceanothus* shrubs were older and contained more dead branches, the fire may not have been contained so easily or extinguished at 30 acres (Estes, pers. comm. 2005).

Direct Effects – Underburning. As part of the Slapjack Project, approximately 4,200 acres could be burned during project implementation; this would include follow-up underburning to other treatments. Analysis indicates that prescribed burning would result in 60 to 80 percent mortality in residual conifers, hardwoods (8 inches dbh and less), and most shrubs. This means that there would be a short-term increase in fire hazard in those units only treated by underburning; however, the reduction of surface fuels by underburning would mitigate this short-term hazard over the majority of the area, in both the underburn-only units, as well as those that are planned for harvest or mastication.

Direct Effects – Firelines. A combination of dozer and hand lines would be used to construct the firelines around the perimeter of the underburn units. It is estimated that approximately 2,463 chains of hand line and 2,389 chains of dozer line may be constructed. Existing roads would be used as fireline when possible. Interior lines could be constructed on some of the larger units to enable Forest Service burning crews to cut off the firing in safe and effective areas if smoke or fire behavior concerns make continued burning problematic. The construction of firelines would reduce the potential for a prescribed fire to escape.

Direct Effects – Short-term Hazard. For treatment units that would require some type of prescribed fire (either piles or underburning) to meet the desired condition, a short-term fire hazard would exist for up to five years (based on past local experience) until the prescribed fire treatment could be accomplished.

Indirect Effects – Fire Suppression. The action alternatives would each increase the likelihood that wildland fires occurring in the treatment units would be successfully suppressed by initial attack hand crews and engines when compared to the no-action alternative. This would occur because of three factors: (1) The repair of forest roads would promote shorter response times for fire suppression resources to initial attack wildland fires; (2) the reduction in fire behavior characteristics as described in the “Direct Effects” section above; and (3) the increase in fireline production rates that, at the very least, would double for hand line construction.

Wildland fires that may escape initial attack, either inside or outside the treatment units, would have a higher likelihood of being suppressed at a smaller size with any of the action alternatives compared to the no-action alternative. One reason for this is that slopes outside the Slapjack Project DFPZs range from 0 to 50 percent. All of the action alternatives are designed to reduce the likelihood that a crown fire entering a DFPZ would continue to spread as a crown fire through the DFPZ. Standing and dead fuels would be treated such that crown fire would not be supported, causing crown fires that enter the DFPZ to be reduced to surface fires. This would be accomplished by increasing canopy separation (crown spacing) to approximately 40 percent and raising crown base heights by reducing ladder and surface fuels.

Also, as previously described, the reduction of surface and ladder fuel loading would enhance the capabilities of firefighting suppression resources by decreasing resistance to control. By reducing the canopy cover, the effectiveness of firefighting aircraft would improve retardant and water penetration through the canopy to the surface fuels, thereby slowing the fire progression so ground units would be more effective. One example of improved effectiveness was observed during the 2003 Peterson fire on the Feather River Ranger District, when the District Fuels Officer and District Suppression Battalion Officer observed effective penetration of aerial retardant in timber harvested areas where canopy cover had been reduced versus areas without any prior treatment (R. Case and B. Henderson, pers. comm. 2005).

The action alternatives would increase firefighter and public safety should a wildland fire occur in the project area due to fuels treatments on approximately 4,420 acres in the Wildland Urban Interface area. These fuels treatments would reduce the likelihood of structures being destroyed or damaged by wildland fires in the communities of Challenge, Brownsville, Forbestown, Clipper Mills, Strawberry Valley, and Feather Falls. Implementing fuel treatments in units that are within 300 feet of residential homes (which is the case in some instances) could prevent intense flaming fronts from reaching structures in the event of a wildland fire. According to the Structure Ignition Assessment Model (Cohen 1997), intense flame fronts (for example, crown fires) will not ignite wooden walls at distances greater than approximately 130 feet.

Treatments in units that are not immediately adjacent to structures could have an indirect effect on structure protection by enabling the fire to be controlled at a smaller size, as described above, or by requiring fewer resources to work on fire perimeter control because of the increased fire suppression effectiveness in the treatment areas, which in turn could allow more resources to be committed to structure protection. The action alternatives would also create safer locations from which suppression resources could establish control points and safety zones for initial or extended attacks because of the reduced number of trees per acre in the treatment units (see “Table 3-52. Basal area and trees per acre in proposed DFPZs” in the “Vegetation” section). The proposed fuel reduction treatments along roads, as well as the road improvements themselves, would promote safer travel for both the public and firefighters.

Indirect Effects – Forest Health. There could be additional indirect effects of the action alternatives from the removal of fuel accumulations and opening the canopy, which would encourage the natural regeneration of fire-tolerant tree and plant species. Individual tree selection harvests would remove the shade-tolerant ladder fuels, which in turn would improve the vigor and amount of the fire-resilient trees and plants in the project area.

Indirect Effects – Riparian Areas. The proposed treatments in the Riparian Habitat Conservation Areas (RHCAs) would contribute to improved riparian health, create a more fire-resilient riparian zone, and reduce fire behavior potential within the RHCAs.

3.5.5.5 Alternatives B, E, and F: Effects of Herbicide Use to Maintain DFPZs

Alternatives B, E, and F propose the use of herbicides on approximately 1,954 acres for the maintenance of DFPZs to help stop the regeneration of tanoaks (where tanoak comprises more than 10 percent of the DFPZ). The effect of using herbicides to maintain DFPZs would be a reduction in the amount of burning or mechanical treatments that would be required to maintain surface fuel treatments in the DFPZs. Alternatives B, E, and F would produce less particulate emissions (smoke from burning and dust from machines and support vehicles) when compared to alternatives C, D, and G. The "Vegetation" section in this chapter contains additional information on the effects and effectiveness of herbicide treatment.

The overall effect on fire behavior would be no different with or without the use of herbicides for DFPZ maintenance.

3.5.5.6 Alternatives C, D, and G: Effects of No Herbicide Use to Maintain DFPZs

DFPZs would be maintained with either underburning or mechanical treatments. In these cases, underburning would not be required for approximately three years after the initial treatments. Because ground fuels would be limited after only three years, a low-intensity underburn may be difficult to accomplish. Burning would have to take place under dryer conditions in order to meet objectives of killing regrowth. The increased fire behavior would increase the risk of harming residual trees and increase the risk of escape. Alternatives C, D, and G would produce more particulate emissions (smoke from burning and dust from machines and support vehicles) than would alternatives B, E, and F.

The overall effect on fire behavior would be no different with or without the use of herbicides for DFPZ maintenance.

3.5.5.7 Alternatives B, D and F: Effects of Herbicide Use to Control Noxious Weeds

Direct Effects. See section 3.5.5.5.

Indirect Effects. Alternatives B, D, and F propose herbicide use on approximately 31 acres of noxious weeds; about 10 of these acres are populated by the Scotch and French broom species, which are highly flammable when mature. The use of herbicides to reduce the potential for noxious weed spread would also reduce the potential fire behavior in the project area.

3.5.5.8 Alternatives C, E, and G: Effects of No Herbicide Use to Control Noxious Weeds

Direct Effects. See section 3.5.5.5.

Indirect Effects. In the absence of herbicide use on the approximate 31 acres, noxious weeds would be killed using other control methods such as manual cutting, hand pulling, backpack torches, and brush cutters. Manual cutting of mature broom species would occur during the summer and late fall when the plants are water stressed; they would then be piled on site and burned. Burning piles when there is little soil moisture can potentially scorch the soil, which would actually be favorable for early seral native plant growth, but likewise for nonnative plant growth. There is, however, the likelihood that pile burning would kill broom seeds located beneath the piles. Another method would be to cover the hand and machine piles with plastic until conditions are moister. This method would still meet the objective of pile consumption and reduction of particulate emissions from smoke.

3.5.5.9 Alternative F

Direct Effects. The effects of alternative F would be similar to alternative B, except 19 group selections would not be implemented in watersheds that are over the Threshold of Concern.

Indirect Effects. This alternative would reduce group selections by approximately 30 acres out of 219 acres; this reduction would not cause a measurable impact on the desired condition.

3.5.5.10 Alternative G

Direct Effects. The effects of alternative G would be similar to alternative C, except that 19 group selections would not occur in watersheds that are over the Threshold of Concern.

Indirect Effects. This alternative would reduce group selections by approximately 30 acres out of 219 acres; this reduction would not cause a measurable impact on the desired condition.

Cumulative Effects of All Action Alternatives. The cumulative effects of the action alternatives are discussed in context of the past, present, and reasonably foreseeable future actions are described below. The action alternatives all propose construction of the same network of DFPZs, so they would all have the same effect of providing connectivity to the Lower Slate and South Fork DFPZs, to the fuel treatment areas on private lands, and to the fuel treatment units proposed for the Slapjack Project (see figure A-5b in appendix A). The degree of cumulative effects of these treatments would depend on several factors. One factor is how the treatments would be located on the landscape in relationship to one another. The other has to do with the timing of implementation and maintenance of the treatment areas, since effectiveness of the treatments would decrease over time if not maintained. This cumulative connectivity has the potential to limit the size of wildland fires, and by doing so, reduce the risk of residences being destroyed or damaged by wildland fire.

All of the action alternatives propose to alter vegetation structure and composition to similar degrees at the landscape scale, hence the condition class in all of the action alternatives would begin to move the landscape towards its historical range (Condition Class 1).

3.5.6 Past, Present, and Reasonably Foreseeable Future Actions

The geographical analysis area for past, present, and reasonably foreseeable future actions is project area and the adjacent areas within 1 mile of the Slapjack Project. It is reasonable to assume that these areas could be directly affected by fuels and fire behavior.

Past Actions. In recent years, there have been a number of timber sales and other projects (see table 3-24 and figure A-5b in appendix A) in the Slapjack Project area on Forest Service or private lands. These sales and other projects were analyzed from a fuels and fire management perspective and were found to be either somewhat beneficial in reducing fuels or nondetrimental to the creation of DFPZs.

Table 3-24. Past, present, and reasonably foreseeable future projects.

Year	Project	Acres	Impacts on Fuels and Fire Behavior
1989	Experimental Forest	11.5	Reduced hazardous fuels
	Oregon Hill	99	Reduced hazardous fuels
1991	Experimental Forest	38.0	Reduced hazardous fuels
	Butter Timber Sale	21.5	Reduced hazardous fuels
1992	Butter Timber Sale	15.3	Reduced hazardous fuels
	Fields Ridge	26.6	Reduced hazardous fuels
	Peterson Ridge	24.8	Reduced hazardous fuels
1993	Bradley Ravine	9	Reduced hazardous fuels
	Costa	41.1	Reduced hazardous fuels
	Fields Ridge	30.7	Reduced hazardous fuels
	Hill Top	5	Reduced hazardous fuels
	Oregon Hill	10.5	Reduced hazardous fuels
	Peterson Ridge	17.1	Reduced hazardous fuels
1994	Big Hill	17.9	Reduced hazardous fuels
1995	Peterson Ridge	6.8	Reduced hazardous fuels
	Big Hill	93.2	Reduced hazardous fuels
1996	Peterson Ridge	15.3	Reduced hazardous fuels
	Beanville	12.9	Reduced hazardous fuels
1997	Mount Hope	16	Reduced hazardous fuels
	PC Snow Damage	296	Reduced hazardous fuels
1999	Woodleaf machine pile thin	392	Reduced hazardous fuels
2000	Peterson Ridge	22.3	Reduced hazardous fuels
2001	West Pendola fire salvage	77.3	Reduced hazardous fuels
	West Pendola fire salvage	50.8	Reduced hazardous fuels
2001	Lower Slate DFPZ	4,852	Reduced hazardous fuels
2005	Pike County site clearance	54.9	Reduced hazardous fuels
Future	FERC licensing	NA	License renewal for Energy Regulatory Commission – no impacts on fuels
Future	Recreation activities	NA	No known recreation activities planned at this time – no impacts on fuels
Future	Roadside Noxious Weeds EIS	Unknown	Reduction of hazardous fuels along the roadways

The year 1989 until present was the time frame used to analyze the fuels treatments in past projects. It was determined that projects prior to 1989 would not have any impact (beneficial or detrimental) on the Slapjack Project because the fuel bed would have gone to a static state. Conditions and projects prior to 1989 are described as an existing condition.

Present Actions. The Slapjack Project is part of a forestwide plan to place DFPZs in strategic locations. Two of the current projects that establish connectivity with the Slapjack Project are the Lower Slate and South Fork DFPZs to the northeast. The Feather River Ranger District has been working with the Fire Safe Councils in Yuba and Butte Counties to design and implement fuels reduction projects on private lands in order to improve connectivity of fuels treatments in the Slapjack Project area. There are currently two projects (funded under Proposition 40) on private lands in the Slapjack Project area.

Private industrial landowners have worked with the Feather River Ranger District to design current projects around the Slapjack Project in order to achieve a reduction in fire behavior similar to those described above for the action alternatives. When the Slapjack Project was in its initial planning stages, a series of meetings were held with numerous stakeholders, including Fire Safe Councils in Butte and Yuba Counties, the California Division of Forestry and Fire Protection, University of California Cooperative Extension, Quincy Library Group, Chy Company, Soper Wheeler Company, Sierra Pacific Industries, Siller Brother Industries, Yuba County Roads Department, and Mooretown Rancheria. These stakeholders believe that fuels treatments on private and National Forest System lands in the project area would enhance the chance that the communities at risk would be protected from a wildfire.

Reasonably Foreseeable Future Actions. The Fire Safe Councils in Yuba and Butte Counties are currently working with private land owners to receive funds (for fiscal year 2006) from Proposition 40 and other grant opportunities in order to complete more fuels reduction work in the Slapjack Project area. The Feather River Ranger District is also in the planning stage for the proposed Sugarberry Project, which would provide additional DFPZ connectivity to the northeast of the Lower Slate DFPZ and protection to the communities of Strawberry Valley and LaPorte. It is anticipated that the stakeholders who collaborated to improve the connectivity of the Slapjack Project would continue to do so into the foreseeable future.

3.5.7 Summary of Effects

The no-action alternative would result in the continued buildup of hazardous fuels, with wildfire severity increasing proportionate to the fuel hazard accumulations. The continued fuels buildup requires suppression actions that are increasingly complex and dangerous to firefighters and the public. Environmental effects from wildfires would include the loss of ground cover and, typically, a high percentage of all-sized trees. Implementation of any of the action alternatives would result in a trend from Condition Class 2 or 3 toward Condition Class 1. Such a shift would move the project area towards the historical range of variability (Condition Class 1). The action alternatives would (1) reduce the potential of high-intensity wildfires in the project area, (2) reduce the likelihood of a fire threatening one of the communities at risk, and (3) create safer areas for suppression resources to fight oncoming wildfire.

3.6 Heritage Resources

3.6.1 Introduction

Archaeological sites, historic buildings and structures, landscapes, and objects are the fabric of our national heritage. Collectively known as heritage or cultural resources, they are our tangible links with the past. The Plumas National Forest is responsible for, and committed to, protecting and managing these important resources in a spirit of stewardship for future generations to understand and enjoy.

3.6.2 Regulatory Framework

Section 101 of the *National Environmental Policy Act* (NEPA) requires the federal government to preserve important historic, cultural, and natural aspects of our national heritage. To accomplish this, federal agencies use the Section 106 process associated with the *National Historic Preservation Act* (NHPA). Passed by Congress three years before NEPA, the NHPA sets forth a framework for identifying and evaluating historic properties and assessing effects on these properties. This process has been codified in 36 Code of Federal Regulations (CFR) 800 Subpart B. The coordination or linkage between the Section 106 process of the NHPA and the mandate to preserve our national heritage under NEPA is well understood and is formally established in 36 CFR 800.3b and 800.8.

NEPA includes reference to ". . . important historic, cultural, and natural aspects of our national heritage." This terminology includes those resources defined as "historic properties" under the NHPA (36 CFR 800.16(l)(1)). Therefore, agencies use the NHPA Section 106 process to consider, manage, and protect historic properties during the planning and implementation stages of federal projects. Locally, the Plumas National Forest uses a programmatic agreement between Region 5 of the U.S. Forest Service, the California State Historic Preservation Office, and the Advisory Council on Historic Preservation to implement the Section 106 process.

3.6.3 Methodology for Assessing Impacts on Heritage Resources

3.6.3.1 Scope of the Analysis

Three levels of analyses were completed to understand the significant themes and extent of heritage resources associated with the Slapjack Project. First, research into the greater history of the project area was conducted to understand historic themes or events that have transpired in time and space. Second, a heritage resource survey was conducted for the project area to identify cultural properties associated with these themes. Lastly, cultural properties were assessed to determine potential effects associated with implementation of the project. The results and relevant rationale for each of these analyses are presented below.

3.6.3.2 Analysis Methods

Heritage resource data for the Slapjack Project is based on information available in the heritage resource files at the Feather River Ranger District. The heritage resource files include literature pertaining to prehistory and history, site records, and atlases that show recorded site locations,

previously surveyed areas, and other heritage resource data. The approximate 5,000-acre analysis area has been surveyed for cultural resources.

3.6.3.3 History of the Project Area

The following is a broad historical overview of the human or cultural mechanisms that have influenced the project area. Ecosystem models based solely on biological and physical elements often disregard the complex interaction between humans and their environment. More than any other phenomenon, cultural landscapes provide a unique opportunity to interpret the history of the effects humans have had on the environment. Together, natural and cultural influences have shaped the overall character of the project vicinity.

Prehistory Period. Archaeological studies on the Feather River Ranger District have primarily been limited to cultural resource inventories for proposed Forest Service activities. Because intensive archaeological research in the Slapjack Project area sufficient to define prehistoric complexes and establish a reliable cultural chronology is not available, cultural assessments and interpretations for the project area rely upon extrapolations from several studies that were completed for lands adjacent to the study area.

Prehistoric cultural complexes that have been documented for this area of the Sierra Nevada are the Mesilla (1000+ BC – AD 1), Bidwell (AD 1 – AD 800), Sweetwater (AD 800 – AD 1500), Oroville (AD 1500 – AD 1850), and Historic (after 1850) (Markley 1978:24; Kowta 1988).

The Mesilla Complex has been described as being the Butte County foothill variant of the Martis Tradition and is believed to have been borne by Hokan speakers from the eastern Sierra and the Great Basin. Diagnostic features of this complex are the milling stone and mano combination, and large shale and basalt leaf-shaped, stemmed, and side-notched projectile points (Kowta 1988:148). At present, little is known about the Mesilla life way. It has been postulated that the settlement system consisted of semipermanent winter villages, seasonal campsites, and special-use locations. Subsistence was probably based on deer hunting and small seed gathering, as evidenced by remaining artifacts (Kowta 1988:97).

The Bidwell Complex appears to be a continuation of the Mesilla Complex with a marked increase and diversification of subsistence activities. Salient features include a mano-milling stone combination (although mortar and pestles were utilized as well), steatite vessels, and small and large basalt projectile points, indicating the introduction of the bow and arrow. Shellfish, salmon, rabbit, and deer bones are evident in middens dating from this period (Kowta 1988:149).

It is suggested that during the Sweetwater Complex, a Maiduan-speaking population from the west or south moved into the area inhabited by the Martis/Mesilla (ancestral Washo) and pushed them to the east. Characteristic traits of this period include a large variety of bone artifacts, as well as the use of shell artifacts such as Olivella shell beads. There appears to be an increase in acorn consumption as evidenced by the increase in acorn-grinding equipment such as cobble and slab mortars and flat-ended pestles. The use of bedrock mortars also began at this time. Point forms from the period include a small corner-notched type and a large leaf-shaped form with incipient side notches (Kowta 1988:150). Although it appears that the Sweetwater Complex coincides with the

arrival of a different group of people into the area, substantive evidence must come from a larger inventory of artifacts, in addition to a definitive assemblage of ancestral Maidu, before any firm conclusions can be drawn.

The Oroville Complex was a continuation of the preceding Sweetwater Complex, with an intensification of characteristic trends and traits. For example, there was an increase in reliance on bedrock milling stations and portable mortars. An increase in trade beads, such as the Olivella disks, oblong disc beads, and Haliotis ornaments suggests an increasingly complex economic exchange and trade system. Housepits from this period have also been discovered; both conical bark superstructure and the semi-subterranean forms have been found. Point types include the Small Desert Side-Notch, the Cottonwood Triangular, small Gunther Stemmed points, and larger corner-notched and leaf-shaped points reminiscent of the Sweetwater period. The traits of the Oroville Complex continued into the Historic period, which is synonymous with the ethnographic Konkow culture.

Ethnographic Period. The Slapjack Project area is in the ethnographic territory of the Northwest or Konkow Maidu. Boundary lines drawn by Dixon (1905:125) and Riddell (1978) through this remote area of the Sierra Nevada differ slightly and are best considered approximate locations. However, due to local topography and hydrology patterns, it seems likely that the Slapjack Project area was more accessible to the Northwestern, or Konkow Maidu, rather than the Nisenan Maidu who lived just to the south of the project area.

The Konkow Maidu are believed to have inhabited this region for at least the last 800 years, but could have arrived as early as 1,200 years before the present. The Konkow inhabited the lower portions of the Feather River region near Oroville and Chico. Their territory ranged from the valley floor and foothills to approximately 4,500 feet above sea level (Riddell 1978:372). Linguistically, the Konkow are related to the Northeastern or Mountain Maidu, both of which are classified as being in the California Penutian language family. Technologically, the Konkow culture is quite similar to other California foothill groups all along the west side of the Sierra Nevada.

Hunting, fishing, and plant gathering were the primary means of subsistence and required seasonal shifts from snow-free low elevations in winter to higher elevations in the summer months (Riddell 1978; Kroeber 1925). Trading was also an important supply avenue (Davis 1961). The bow and arrow were generally used for hunting, with deer being the principal game. Deer were often killed during large drives where the animals were driven over cliffs or ambushed along migration trails. Elk, ground squirrel, rabbit, and game birds were also hunted. Nets and gigs were used for salmon and eel fishing in the Feather River and its tributaries (Riddell 1978).

The principal plant food collected was the acorn, which was gathered in the early fall and stored in granaries. Pine nuts were another basic food item. Other nut meats collected included hazel, buckeye, and nutmeg. Acorns and some other nuts required extensive processing before eating due to high levels of tannin or prussic acids. Wild mint, manzanita berries, and various roots, seeds, bulbs, and greens were also harvested (Riddell 1978).

Abundant resources in the watershed provided many of the food and material requirements necessary for Konkow’s survival. The Konkow also enhanced the quantity and quality of desirable species, primarily through the use of fire. Fire was used to keep areas free of brush, manage game, stimulate production of food crops, decrease insects and diseases, and facilitate food gathering.

Extensive trading took place between the Konkow and neighboring cultural groups. During trades they received bows and arrows, obsidian, skins, sugar pine nuts, deer hides, miscellaneous foods, and clam disc and other shell beads. They supplied salmon, salt, obsidian, log rafts, digger pine nuts, and beads of clam and other shell to other groups (Davis 1961:34; Kroeber 1925:399).

Settlements in the foothill and mountain regions of the Konkow were located on ridge tops or terraces due to the steep and often rugged side slopes of the Feather River and its tributaries. However, the Konkow took advantage of the opportunity to settle along rivers when topographic conditions allowed. Village sites consisted of an average of five to eight houses and a population of 35 to 40 people. The number of villages that comprised a "village community" varied, but generally did not exceed 200 people (Riddell 1978; Kroeber 1925).

Historic Period. The extensive gold deposits of the project area were discovered relatively late in the Gold Rush. It was more than two years after John Marshall's discovery at Coloma before this remote, mountainous region yielded its first nugget to the gold seekers of 1849 (Baker and Shoup 1985).

The Gold Rush miners who came during the early years were transient adventurer's intent on getting rich quickly. For the first few years of mining (1849–1852), activity focused on working the natural watercourses by pan, rocker, and sluice box. By 1853 areas away from these streambank diggings, as they were initially called, had become important, and a rush for water claims then set in. The hydraulic mining technique also arrived at this time and small-scale drifting ("drifts" or "tunnels" as they were often called) into the gravel banks of the ancient river channel was also underway (Sinnott 1977:11, 314). An important first step towards the successful mining of the gravel deposits was the transport of water to mining sites. The years 1853 and 1854 saw a rush for water claims since water was needed to wash the drift dirt and undertake hydraulic operations (Baker and Shoup 1985: 25). The rush for water in 1853 to 1854 resulted in the creation of a number of major ditch and flume systems in the area (Baker and Shoup 1985: 26).

Hydraulic mining was carried out by applying a stream of water under high pressure onto a gravel bank. The water blasted the bank down, and the gravels containing the gold were then directed into a sluice box, which caught the heavier gold. The water and mud went into a stream or river. Using this system, a few men could process hundreds of tons of earth a day, making it economical to mine gravel worth only a small amount per square yard (Baker and Shoup 1985: 26).

Drift mining was used when lava or other hard rock made hydraulic mining impractical, or when the gold in the gravel was mostly on bedrock. Thus, adits or "tunnels," as they were usually called, were more frequently used to penetrate the bank, using rails and ore cars to bring the pay gravel out of the mine. The first real boom in drift mining came in the late 1850s (Baker and Shoup 1985: 26).

The founding and early development of drift mines marked another stage in a transition, which was underway during the mid and late 1850s. This transition had a number of aspects, which collectively marked the demise of the Gold Rush and the rise of a much different type of political economy and society. The most important of these aspects included more capital-intensive mining, the rise of reasonably stable small towns, occupational diversification in these towns, improved transportation and communication in these towns, an alteration of the dominant cultural forms, the

arrival of women and children, better mining technology, and the development of sawmills and logging (Baker and Shoup 1985: 27).

The key thread in this transition was the rise of small towns, something that was a constant process at least from the mid 1850s on. It was in the small towns of the project area – Challenge, Clipper Mills, Feather Falls, and Forbestown – that the capital needed for more modern mining was accumulated, that occupational diversification took place, where women and children usually lived, and where the relative stability associated with the post-Gold Rush period was focused. Thus, the demise of the "Gold Rush" in the project area was associated with the growth of towns and increase in townspeople (Ibid.). The economies associated with most mining communities were constant boom and bust.

The Town of Challenge – In the early 1850s, gold was discovered in the creeks in the Challenge area including Little Oregon Creek, Dry Creek, and Costa Creek. By the 1860s much of the gold had been depleted in the area. The town of Challenge did not exist until 1862, when a small sawmill located at Strawberry Valley was moved to the Challenge area. This mill was bought by Andrew Leach in 1874. Mr. Leach owned mills at Woodleaf and Clipper Mills. The center of this company became Challenge, which included more than 20 buildings (warehouse, blacksmith shop, machine shop, store, Mr. Leach's home. etc.). A system of flumes was constructed to expedite the transport of lumber from the mills to the California Northern Pacific Railroad at Honcut. In 1884 Mr. Leach bought a locomotive and built a narrow-gauge railroad line from the Challenge mill to Beanville, and by 1889, it extended up to Indian Creek near Woodville (Woodleaf) (Mossinger 1995: 79-82; cited in: Dwyer and Nilsson 2004). In 1887 the Challenge and Woodville sawmills burned to the ground and heavy snow collapsed the flumes (Ibid. 95). All of Mr. Leach's properties were sold to pay his creditors. (Dwyer and Nilsson 2004: 17).

By the 1880s, the main roads traversed through Challenge, which included a toll road that ran between Marysville and Woodville (Woodleaf), with a gate and tollhouse at Challenge. J.W. Ribble built the Challenge Hotel in 1886, which was located near the LaPorte Ranger District office (now closed) (McDonald and Lahore 1976: 85; cited in: Dwyer and Nilsson 2004).

Challenge was home to a large number of Chinese immigrants in the 1880s and 1890s. As with most Chinese immigrants at the time, they lived at the outskirts of town, and had a store and several cabins (McDonald and Lahore 1976: 86; cited in: Dwyer and Nilsson 2004).

The Town of Clipper Mills – The first sawmill in the Clipper Mills area was built in 1852, north of the present town on Grizzly Creek. The "Clipper Mill" was constructed between 1855 and 1856. A store and hotel were built near the mill. The first post office was established in 1861, and a school was built in 1868 (Pater 1976:92; cited in: Dwyer and Nilsson 2004).

The Town of Feather Falls – The town of Feather Falls was originally a logging camp (name unknown) of the Hutchinson Lumber Company. In 1938 (approximate date), the post office in Mooretown moved to the town of Feather Falls (Stephens 1989: personal communication). Mooretown was a mining town and trading center with a population large enough to warrant a post office (Gudde 1975:224). Mooretown was located approximately 0.5 mile west of the present town site of Feather Falls. It is not known what caused the demise of Mooretown, but it is presumed that the decline in gold mining was a major contributor (Tibbetts 1989).

Camp One and Camp Eighteen were logging camps set up to accommodate the Hutchinson Lumber Company. Camp One is located approximately 1.6 miles northeast of the town of Feather Falls. Camp Eighteen is located about 4 miles northeast of Feather Falls. While most logging camps were portable, Camp One and Camp Eighteen remained stationary because they were machine maintenance locations. Camp One was in existence between 1921 and 1922. Camp Eighteen lasted longer than Camp One, but no date of operation was noted (Stephens 1989: personal communication; cited in: Tibbetts 1989).

Rogersville was a small settlement approximately 2 miles northeast of Feather Falls, just northeast of Camp One. It predates Camp One and was founded around the same time lumber operations began in the Feather Falls area. This settlement ended sometime in the 1920s (Stephens 1989: personal communication; cited in: Tibbetts 1989).

The Hutchinson Lumber Company operated a sawmill in Oroville and shipped logs via the Feather River railway that they built in 1923. The Feather River Railway was originally a 21-mile logging line that connected with the Western Pacific Railway at Bidwell Bar and then ran up the South Fork of the Feather River. “Logs were carried over the private line to the Western Pacific connection and hence to the mill south of Oroville” (Stephens 1963:3). The Feather River Railway was built by the Hutchinson Lumber Company at a cost of $1 million dollars (Stephens 1989: personal communication). This railway was a private logging railroad until 1940 when it became a common carrier.

The Hutchinson Lumber Company’s Oroville Mill was a three-band mill consisting of one 8-foot and two 9-foot saws. The mill measured 305 feet by 209 feet. The mill ran two shifts per day. In 1926 the mill cut 100 million board feet of lumber, with 20 million board feet of this going into lumber for fruit boxes. Pine accounted for 55 percent of the trees cut in 1926. This saw mill burned to the ground in 1927 (Stephens 1989: personal communication).

Because of high production costs and high mortgage rates, timber could not be cut fast enough to meet the Hutchinson Lumber Company’s annual monetary demands. This, and the loss of the Oroville mill, caused the Hutchinson Lumber Company to claim bankruptcy in 1927. It was purchased by two men from West Virginia—A.H. Land, a banker, and Dr. O.O. Cooper, a doctor and surgeon–and was renamed the Feather River Pine Mill, Inc. (Stephens 1989: personal communication).

Extensive legal complications with the insurance company over the fire damage claim, and the economic depression of 1929, prohibited the building of the new mill until 1938; it was called the Feather River Pine Mill. This new mill was a two-band mill, built at a logging camp of the bankrupt Hutchinson Lumber Company and became the town of Feather Falls (Ibid.).

Because of the high production demands placed on the Hutchinson Lumber Company to meet their extensive mortgage overhead, they were not known for their quality lumber. Because the Feather River Pine Mill did not have the extensive mortgage overhead that the Hutchinson Lumber Company had, they became known for their quality lumber. The Feather River Pine Mill operated one shift per day and cut about one-half the lumber Hutchinson Lumber Company cut (Ibid.).

The Georgia Pacific Railway Company bought the Feather River Railway and the Feather River Pine Mill holdings in 1957. Because of the extensive holdings of this railway company, it was

considered a monopoly, and the U.S. Government forced Georgia Pacific to sell 20 percent of their holdings. This portion of the Feather Falls Railway was purchased by Louisiana Pacific, which is the current owner of the town of Feather Falls (Ibid.).

The Town of Forbestown – In 1849 Ben Forbes, a native of Philadelphia, Pennsylvania, began mining the South Fork Feather River. Forbes eventually settled in the Forbestown area and opened a trading store. The town of Forbestown was established in 1852, with a post office opening in 1854 (Carmosino 1998: 41; cited in: Dwyer and Nilsson 2004). It was located at the head of Forbestown Ravine approximately 0.75 mile from the present day town of Forbestown. The Forbestown mining district was one of the most significant lode deposits in Butte County (Clark 1970: 15). The district encompasses the Feather Falls area, the Brownsville area to the south, and the town of Hurleton, Springtown, and Bidwell Bar areas to the west.

Forbestown went through two major mining booms. The first occurred between 1850 until around 1865, with the population expanding to approximately 3,000. This made Forbestown the second largest town in Butte County (Carmosino 1998: 41; cited in: Dwyer & Nilsson 2004). By 1859, Forbestown had 5 hotels, 10 saloons, 2 dance halls, 2 drug stores, 1 bank, 3 general stores, barber shops, an Odd Fellows Hall, and a Masonic Hall (Ibid. cited in: Dwyer and Nilsson 2004). The first library and church in Butte County were in Forbestown.

By the 1860s, most of the placer miners were leaving the area due to the depletion of easy-to-obtain gold. Between the 1870s and 1888, hardrock mining became the second boom for Forbestown. In 1873 the Forbestown Consolidated Quartz Mining Company had a 5- and 10-stamp mill. By 1877 there were five mills in the area. The 1884 Sawyer Decision, which called for debris dams to be built to control silt into the rivers and streams, brought an end to many mills due to the exorbitant costs of running a hydraulic operation (Ibid. 50; cited in: Dwyer and Nilsson 2004). Major mines were the Golden Queen, Gold Bank, Shakespeare, and Golden Fleece.

The 1880s mining boom was a rebirth for Forbestown, with the building of a new saloon, doctor’s office, boarding house, and shoe shop. In 1903 the Gold Bank Mine closed and was purchased in 1909 by Michael Cooney, a native of Ireland. Cooney and B.F. Forbes consolidated the Gold Bank, Golden Queen, Miller, and Shakespeare claims. These consolidated mines were closed in 1924, and a lien was filed by unpaid miners in 1925. The Forbestown post office was closed in 1925 but opened again in 1938 with a small mining boom during the depression (Ibid. 58-60; cited in: Dwyer and Nilsson 2004).

3.6.4 Affected Environment (Existing Conditions)

Consultation with the tribes and local Native American communities and/or interested parties was initiated in accordance with the Region 5 Programmatic Agreement, *National Historic Preservation Act*, and other laws and regulations.

The Forest Service acknowledges that contemporary Native American interests include traditional cultural properties (sites associated with cultural practices or beliefs that are rooted in history and important in maintaining cultural identity), and plant gathering sites for basket materials, medicines, and food resources. To date, the tribes have not identified any traditional cultural properties within the Slapjack Project boundaries.

Cultural properties identified during literature reviews, inventories, or surveys were assessed to determine potential effects associated with implementation of the project. Results of the analysis are discussed below.

Surveys or inventories resulted in the identification of 73 cultural resource properties within the proposed Slapjack Project area; 26 sites are related to prehistoric use. These sites consist of campsites, food processing stations, and tool production stations. There are 46 sites related to historic uses, primarily mining, that took place between 1850 and the 1930s. The sites consist of historic encampments, dams, ditches, mine adits, cabins, turpentine trees, a lookout, and cabin flats. Associated artifacts and features represent all aspects of historic mining, from industrial equipment to daily living. There are also seven multi-component sites that consist of both prehistoric and historic features and artifacts.

Alternative A (No Action)
- No treatments would be implemented.

Alternative B (Proposed Action)
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres), mechanical and manual methods, and prescribed burning

Alternative C
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Alternative D
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds with herbicides (up to 31 acres)

Alternative E
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds without herbicides

Alternative F
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres)

Alternative G
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

3.6.5 Environmental Consequences

Heritage resources have been considered in all aspects of the Slapjack Project, including the seven alternatives analyzed in this document.

3.6.5.1 Alternative A (No Action)

No ground-disturbing activities would occur under the no-action alternative; hence, there would be no effects on heritage resources.

3.6.5.2 All Action Alternatives

The treatments proposed under the action alternatives would have no direct or indirect effects on heritage resources because all archaeological sites would be protected using Standard Resource Protection Measures.

3.6.5.3 NHPA Section 106 Assessment

The effects of the project on heritage resource sites were analyzed in compliance with Section 106 of the *National Historic Preservation Act*.

Although the project activities have the potential to affect heritage resources, no effects are anticipated due to the following protection measures that would be implemented, as appropriate, for all heritage resources that could be affected by project implementation. Application of the following Standard Resource Protection Measures would result in the project having "no effect" on heritage resources:

- All proposed activities, facilities, improvements, and disturbances shall avoid heritage resource sites. Avoidance means that no activities associated with the project that may affect heritage resource sites shall occur within a site's boundaries, including any defined buffer zones. Portions of the project may need to be modified, redesigned, or eliminated to properly avoid heritage resource sites.
- All heritage resource sites within the area of potential effect shall be clearly delineated prior to implementing any associated activities that have the potential to affect heritage resource sites.
- Buffer zones may be established to ensure added protection where the Forest or District Archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of heritage resource sites (e.g., historic buildings or structures; historic or cultural properties important to Native Americans). The size of buffer zones needs to be determined by the Forest or District Archaeologist on a case-by-case basis.
- When any changes in proposed activities are necessary to avoid heritage resource sites (e.g., project modifications), these changes shall be completed prior to initiating any activities.
- Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.

3.6.6 Past, Present, and Reasonably Foreseeable Future Actions

3.6.6.1 Past Conditions

As indicated in the above general history of the Slapjack Project area, there are numerous archaeological sites and features. Prehistoric sites date from 150 to 7,500+ years before present. There are remains of prehistoric housepits, village sites, lithic scatters, and bedrock milling features and artifacts.

Since the landscape is never static, it is difficult to predict the impact Native Americans had on the land. Current studies on fire ecology suggest that Native Americans used fire as a tool to control vegetation. Based on ethnographic data, these studies are suggesting that vegetation control occurred primarily within close proximity to larger villages and was used to reduce brush, control insects, and enhance certain desirable species of plants. A local example of this is the burning of beargrass to enhance the plant's qualities for basket weaving. Based only on ethnographic data, it is impossible to know the true extent of vegetative control measures used.

Historic land uses did have major impacts on the landscape during the gold rush, the settlement and industry of post gold rush, and the impact of logging and ranching. Evidence of the magnitude of European settlement is found in numerous mining features such as ditches, reservoirs, and hydraulic pits. Early photographs of historic townsites provide a glimpse of landscapes almost completely barren of trees. All trees were removed for building house, townsites, heat sources, and the shoring of mining adits.

Logging mills were built in the project area during the 1850s, and by the 1890s, the denuding of timbered land on the East Coast brought lumber companies West. These companies bought up millions of acres of timbered lands. As the easily accessed trees were cut, logging railroads were built to acquire more timber. Archaeological sites and features associated with lumbering include logging camps, lumber mills, railroad grades, and artifacts.

Prior to the mid 1970s, there were no archaeologists working for the Forest Service. At that time, there were few protection measures for archaeological resources. In fact, digging and collecting on archaeological sites was a common practice. By the early 1980s, cultural resource surveys and site protection measures were in place. Today, all archaeological sites are protected from any project activities.

3.6.6.2 Present Conditions

As indicated previously, treatment areas in the Slapjack Project area have been surveyed for archaeological sites. All archaeological sites located during surveys would be protected from project activity.

Some archaeological sites that were monitored during project survey show damage not only from looting but from off-highway vehicle (OHV) traffic. In the past, isolated sites that were inaccessible to many people are now more accessible by OHV users. Looters generally dig holes in places where metal detectors give off a signal, or they are digging in areas they think may contain whole bottles.

In addition to the growing use of OHVs in the project area, websites are being developed where forest visitors are provided directions to a few archaeological sites by geocaching. Geocaching is a popular high-tech treasure hunting game of locating a cache of items. Global Positioning System (GPS) coordinates are posted on the Internet by those hiding the cache. Using a GPS unit, treasure hunters then trek into the backwoods to find the hiding spot of the cache.

3.6.6.3 Future Conditions

The Forest Service will continue to protect archaeological sites from project activities in the future. But, as more and more people are drawn to National Forests to recreate, and with the ever increasing use of motorized vehicles, it becomes a difficult challenge to protect archaeological resources. The Forest Service is in the process of designating OHV routes in order to control use and avoid impacts on all resources. OHV routes would not be designated through known archaeological sites. The likelihood and extent of illegal off-road use, geocaching, and looting of archaeological sites is unpredictable.

Future impacts on archaeological sites may increase due to increased access to the Forest, although the likelihood and intensity of the impacts are unknown. The Slapjack Project itself would not impact archaeologist sites because the sites would be protected from project activities.

The protection of archaeological sites is more than just flagging and avoiding as is the practice before project activities. Educating the public about the fragile, finite nature of archaeological sites is paramount to site protection. Public education can be accomplished by developing interpretative signs, lectures, and brochures that provide information on the history of the sites, as well as archaeological site protection measures.

3.6.7 Summary of Cumulative Effects

Archaeological sites would be protected using Standard Resource Protection Measures; therefore, no cumulative effects on heritage resources are expected.

3.7 Human Health and Safety

3.7.1 Introduction

The Forest Service proposes to construct 4,419 acres of DFPZs using a variety of manual, mechanical, and thermal treatment methods. Chemical treatment methods would be used as a preventive maintenance strategy on 1,954 acres of DFPZs. Noxious weed control would entail a combination of manual, mechanical, thermal and up to 31 acres of chemical treatment methods.

3.7.2 Regulatory Framework

3.7.2.1 Federal Requirements

The U.S. Environmental Protection Agency (EPA) regulates the use of pesticides under the authority of two federal statutes: the *Federal Insecticide, Fungicide, and Rodenticide Act* and the *Federal Food, Drug, and Cosmetic Act.*

Federal Insecticide, Fungicide, and Rodenticide Act (as amended on January 23, 2004). This Act provides the basis for regulation, sale, distribution, and use of pesticides in the United States. It authorizes the EPA to review and register pesticides for specified uses. The EPA also has the authority to suspend or cancel the registration of a pesticide if subsequent information shows that continued use would pose unreasonable risks.

Federal Food, Drug, and Cosmetic Act. This Act authorizes the EPA to set maximum residue levels, or tolerances, for pesticides used in or on foods or animal feed.

Food Quality Protection Act of 1996. This Act amended the *Federal Insecticide, Fungicide, and Rodenticide Act* and *Federal Food, Drug, and Cosmetic Act*, setting tougher safety standards for new and old pesticides and making uniform requirements regarding processed and unprocessed foods.

Endangered Species Act of 1973. This Act prohibits any action that can adversely affect an endangered or threatened species or its habitat. In compliance with this law, the EPA must ensure that use of the pesticides it registers will not harm these species.

Currently, the Center for Biological Diversity has filed a lawsuit against the EPA for alleging that EPA violated the *Endangered Species Act* by failing to consult the U.S. Fish and Wildlife Service on pesticide risks to the California red-legged frog, an endangered species whose habitats are, in some cases, hundreds of miles from the farms where the 66 pesticides at issue are applied. As a result, a federal court ordered the EPA to start assessing pesticide risks to the California red-legged frog.

Pending the outcome of the lawsuit, the Plumas National Forest will follow all label directions for the application of pesticides. The Plumas National Forest will make appropriate changes to projects on the Forest if there are changes to the label or restrictions on the use of certain pesticides resulting from the EPA's consultation process on these pesticides and the red-legged frog. In compliance with the Council on Environmental Quality regulations for implementing the *National Environmental Policy Act*, this environmental impact statement (EIS) contains an analysis of project effects on Threatened and Endangered species, as appropriate, including consultation with the U.S. Fish and Wildlife Service, when required.

3.7.2.2 Pesticide Labels and Material Safety Data Sheets

Federal laws require that specific information or precautions be printed on pesticide labels to protect human and environmental health. Precautionary statements provide important information on hazards that applicators must be aware of before using a specific pesticide. Each chemical label specifies the suggested or maximum application rate (concentrate) of the chemical to be applied for the various application methods (such as by hand or aerial spray), and may also contain information on first aid and decontamination procedures.

A Material Safety Data Sheet is designed to provide both workers and emergency personnel with the proper procedures for handling or working with a particular substance. The data sheets include information such as physical data (melting point, boiling point, and flash point), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill/leak procedures. These are of particular use if a spill or other accident occurs.

3.7.2.3 State Requirements

States can register pesticides under specific state pesticide registration laws after a pesticide is registered by the EPA. Ultimately, states have primary responsibility for pesticides used within state borders and may have more stringent requirements for registering pesticides for use in that state.

California has the nation's strictest pesticide laws and regulations. The California Department of Pesticide Regulation (DRP) protects human health and the environment by regulating pesticide sales and use in the state. The DPR evaluates a pesticide thoroughly (under guidelines of the Food and Agriculture Code) before it is marketed and used in California. Strict oversight begins with product evaluation and registration; continues through the licensing of commercial applicators, dealers, and consultants; and concludes with environmental monitoring and testing.

The DPR also evaluates pesticides under California's unique climatic and cultural conditions. Pesticide residues decay differently under hot dry conditions than under warm humid conditions. Because of the varied climatic conditions in the state, combined with local use enforcement, some pesticides are restricted to certain areas of California, rather than a statewide ban.

The DPR reviews labels for consistency with EPA requirements, accuracy of human health hazards based on toxicology data, regulatory enforcement of label requirements, and adequacy of worker and environmental protection. The DPR sometimes denies registration to products that were approved by the EPA. The DPR works with registrants and the EPA to recommend revisions to the label, since label language is under the sole jurisdiction of the EPA. Any changes to the label must be approved by the EPA before the product can be sold in the United States. The DPR may also impose use restrictions beyond those listed on the product label.

3.7.2.4 Forest Requirements

The 1988 *Plumas National Forest Land and Resource Management Plan* (commonly referred to as the "Forest Plan") was the first such forestwide plan adopted by the Plumas National Forest. The Forest Plan remains in effect and is subject to two major amendments. The Forest Plan and the documents amending it are described in chapter 1, section 1.5.4 (Forest Plan Direction).

3.7.3 Methodology for Assessing Impacts on Human Health and Safety

3.7.3.1 Scope of Analysis

The geographic boundary for the human health and safety analysis is limited to the Slapjack Project area for direct and indirect effects. The area encompassed by the six Hydrologic Unit Code (HUC)6 watersheds that intersect the Slapjack Project area was queried for pesticide use, and these HUC6 watersheds were analyzed for the potential cumulative effects of proposed herbicide application. The geographic boundary for cumulative effects analysis is limited to the Dobbins Creek, Frey Creek, Lower Dry Creek, McCabe Creek, New Bullard's Bar Reservoir, and the Ponderosa Reservoir watersheds.

The existing condition analysis is based on pesticide use data compiled by California Department of Pesticide Regulation and was tabulated by (HUC)6 watersheds for the herbicide risk assessment.

The time frame for cumulative effects analysis generally extends back two to three years, depending on the residual effects (the length of time a chemical is active in the soil) of the herbicide being used. Various herbicides have different residual soil activity. Foliar (leaf) herbicides, such as glyphosate, bind with soil particles and is not readily absorbed from the soil by plants. Foliar and soil active herbicides, such as imazapyr, can remain active in the soil for six months to two years, and hexazinone may remain in the soil at low concentrations for up to three years after application. However, to establish trends or patterns of herbicide use, cumulative effects analysis may extend back five years.

3.7.3.2 Analysis Methods

This analysis is based on portions of "Appendix G: Human Health Risk Assessment" of the *Herger-Feinstein Quincy Library Group Forest Recovery Act Final Supplemental Environmental Impact Statement* (HFQLG Act final supplemental EIS) that pertain to the proposed use of imazapyr and triclopyr formulations in the project area. It is also based on site-specific information for the Slapjack Project used to calculate the risks of herbicide exposure to workers and the public. The Slapjack Project proposes to use the same application rates of imazapyr and triclopyr (see tables C-1 and C-2 in appendix C of this EIS) as analyzed in the HFQLG Act final supplemental EIS; therefore, a separate human health risk assessment is not required. The risk assessment uses standard methodology widely accepted by the scientific community, regulatory agencies, and the United States Department of Agriculture, Forest Service, *Vegetation Management for Reforestation Final Environmental Impact Statement*, 1988, pages 4-62 to 4-122 and appendix F; National Research Council 1983; EPA 1986).

The risk assessment uses the analytical elements described by the National Research Council (1983): hazard analysis, exposure analysis, and risk analysis. The *hazard analysis* focuses on determination of the toxic properties of each herbicide. Human hazard levels are derived primarily from results of laboratory experiments on animal models, supplemented where appropriate with information on human poisoning incidents, epidemiology studies, and data on chemical structure. The *exposure analysis* estimates people's potential exposure to herbicides, determines the doses likely to result from those estimated exposures, and determines the number and characteristics of people in the exposed populations. The *risk analysis* combines the hazard information with the dose estimates, and

the probability that they could occur, in order to predict health effects on individuals under the given conditions of exposure.

The risk assessment for the HFQLG final supplemental EIS is based largely on the risk assessments conducted by Syracuse Environmental Research Associates, Inc. (SERA). Details regarding the specific methods used to prepare the SERA human health risk assessments referenced in this document are provided in SERA (2001), while detailed explanations of specific methods used in estimating occupational exposure are provided in SERA (1998).

The analyses of past use of pesticides in the Slapjack Project area were derived from pesticide use reports queried from the California Department Pesticide Regulation website: http://www.cdpr.ca.gov/docs/pur/purmain.htm.

3.7.4 Affected Environment (Existing Conditions)

This section describes the types of risks to workers and the public from activities proposed for the Slapjack Project. The risk assessment in appendix G of the HFQLG Act final supplemental EIS examines the potential health effects on people who might be exposed to imazapyr and triclopyr, the herbicides proposed for maintaining DFPZs and controlling noxious weeds under the Slapjack project. The people potentially at risk fall into two groups: workers and members of the public. Workers include applicators, supervisors, and other personnel directly involved in treatment activities. The public includes forest visitors or nearby residents who could be exposed through drift, direct contact with sprayed vegetation, by eating food items such as berries growing in or near treated areas, eating game or fish containing herbicide residues, or by drinking water that contains such residues. This exposure model also takes into account possible exposure for Native American gatherers. The individuals most likely to be exposed to herbicides are the backpack applicators, contract inspectors, residents who live near the treatment areas, and forest visitors such as hikers and backpackers, hunters, anglers, and firewood and other gatherers.

3.7.4.1 Hand Methods

Worker Safety. Working with hand tools on steep slopes and under unfavorable site conditions can be inherently hazardous. Workers can be cut by tools, hit by falling brush, or injured by falling onto sharp stumps or ends of cut brush. Potential injuries range from minor cuts, sprains, abrasions, and bruises to severe injuries such as arterial bleeding, fractures, or concussions. A severe injury may even kill a worker. Other types of health risks include fatigue, heat exhaustion, heat stroke, tendon or ligament damage, aggravation of joint diseases, heart attack, or stroke. The likelihood of injury increases as slope, brush density, brush height, and size of crew increase and when a crew works in a relatively concentrated area. Hand clearing of vegetation is relatively slow work; this exposes workers to the hazards of this work for longer periods in relation to other, more efficient methods of clearing vegetation. Typical crew sizes are 5 to 10 chainsaw, brush cutter, or hand tool operators and one foreman.

Public Safety. Members of the public would be at low risk since they would likely not be sufficiently close to hand treatment operations.

3.7.4.2 Mechanical Methods

Worker Safety. Equipment operators can be injured in several ways. Accidents can occur when operators lose control of machines on steep slopes or slippery terrain and under conditions of poor visibility. Falling trees or limbs, rolling rocks, and flying debris can injure other employees working in the area. Excessive noise can damage the operator and adjacent worker's hearing. The typical crew size for a mastication machine or dozer would be the heavy equipment operator and a swamper (ground personnel assigned to equipment who work with the operator or can warn other individuals of hazards).

Public Safety. Risks to the public from use of mechanical equipment would be low. Large masticating equipment can throw debris out 200 feet, but the use of signing and swampers would reduce the chance the public would be in an area that is being treated. Masticating equipment can cause fires, which if not immediately controlled, could endanger people and property. Injuries are possible from accidents when heavy equipment are transported along roads or when the public does not see or ignores safety warning signs and enters the treatment unit.

3.7.4.3 Thermal (Prescribed Burning) Methods

Worker Safety. Prescribed burning projects create risk of smoke and heat injury to both workers and the public. Effects on workers range from eye irritation, coughing, and shortness of breath to severe burns, scars, or death. In addition, chronic exposure to smoke can lead to long-term adverse health effects, such as emphysema or lung cancer. Wood smoke presents a cancer risk due to the presence of at least five polyaromatic hydrocarbons. Prescribed burning operations require specialized equipment and specialized training. A typical operation may have several fire engines (3 to 5 person) and several 10- to 20-person hand crews.

Public Safety. Smoke may have local, transitory effects on air quality. Sensitive members of the public may experience irritations of the eye, throat, or lung from even low-level exposures. Risks of adverse chronic health effects on the public from smoke exposure should be lower than the risks to workers because the public exposures would be much less than worker exposures. In addition, public notices are placed in local newspapers, and signs are installed on roads accessing prescribed burn areas to inform the public of the prescribed burn. This method of treatment is expected to result in minimal adverse effects on public safety.

3.7.4.4 Chemical Methods

Worker Safety. Injuries to workers from herbicide use would be same as manual methods, except for working with cutting equipment, but with the addition of overexposure to herbicides. Backpack herbicide applications typically can treat more vegetation that just manual grubbing or chainsaw cutting on a per-acre basis. Ground applications of herbicides are conducted by workers carrying backpack sprayers. The majority of the backpack applicators are not from the local area. Crews work for contractors who have successfully bid on Forest Service reforestation projects and can travel over wide geographic areas as they complete work for the Forest Service and private landowners. The typical crew size for hand application contracts is 12 sprayers, a "rinser" to wash off nontarget plants inadvertently sprayed, a foreman, and a mixer.

Forest Service contract inspectors are also exposed during project implementation but to a much lesser degree than contract sprayers. Besides wearing personal protective equipment, inspectors routinely reduce their exposures by staying upwind of applicators and choosing their routes for inspection within the treatment unit.

Public Safety. Public exposure, and hence risks from herbicide use, would be reduced by establishing streamside buffer zones, following management requirements for reducing herbicide drift, and posting signs around treated areas during and after herbicide applications.

3.7.5 Environmental Consequences

A comprehensive analysis of potential adverse health effects on workers and the public is included in appendix F of the Forest Service Region 5 final EIS on vegetation management (USDA Forest Service 1988), the SERA risk assessments for imazapyr and triclopyr (SERA 2003, 2004b), the HFQLG final supplemental EIS (USDA Forest Service 2003a), and the Surfactant Risk Assessment (USDA Forest Service 2002a).

Table 3-25 displays the number of acres of DFPZ construction and acres of preventive and long-term maintenance and noxious weed control treatments by alternative for direct, indirect, and cumulative effects. The effects of herbicide use are described in appendix C.

Alternative A (No Action)
- No treatments would be implemented.

Alternative B (Proposed Action)
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres), mechanical and manual methods, and prescribed burning

Alternative C
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Alternative D
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds with herbicides (up to 31 acres)

Alternative E
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds without herbicides

Alternative F
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres)

Alternative G
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

3.7.5.1 Alternative A (No Action)

Direct and Indirect Effects. Alternative A would have no effects on worker or public health because no DFPZ construction, DFPZ maintenance, or noxious weed control activities would occur.

Cumulative Effects. There would be a high risk to firefighters and other fire personnel (pilots, support personnel) under this alternative. Wildland fire suppression under the existing and future conditions of this area would be far more difficult to implement due to the resistance to control and the flame lengths associated with large brush fires in this type of terrain.

There would be some cumulative effects on public health and safety. Existing fuel loads would remain untreated and subsequent growth of vegetation would add to these loads. In the future, there would be an undetermined risk of further wildland fires to private property and homes.

Table 3-25. Comparison of treatment acres for DFPZ maintenance and noxious weed control by alternative.

	Alternatives						
Direct and Indirect Effects	**A**	**B**	**C**	**D**	**E**	**F**	**G**
DFPZ Construction (acres)							
1. Manual	0	87	87	87	87	87	87
2. Mechanical	0	3,671	3,671	3,671	3,671	3,671	3,671
3. Thermal	0	661	661	661	661	661	661
4. Chemical	0	0	0	0	0	0	0
Totals	**0**	**4,419**	**4,419**	**4,419**	**4,419**	**4,419**	**4,419**
DFPZ Preventive Maintenance (acres)							
1. Chemical	0	1,954	0	0	1,954	1,954	0
Noxious Weed Control (acres)							
1. Manual and Thermal	0	0	33	0	33	0	33
2. Manual, Thermal, and Chemical	0	31 (33)[b]	0	31 (33)[b]	0	31 (33)[b]	0
Cumulative Effects	**A**	**B**	**C**	**D**	**E**	**F**	**G**
DFPZ Long-term Maintenance[a] (Estimated Acres) (10-year Intervals)							
1. Manual	0	87	87	87	87	87	87
2. Mechanical	0	1,717	3,671	3,671	1,717	1,717	3,671
3. Thermal	0	661	661	661	661	661	661
4. Chemical	0	1,954	0	0	1,954	1,954	0
Totals	**0**	**4,419**	**4,419**	**4,419**	**4,419**	**4,419**	**4,419**

Notes:

a. The treatment acres in this table are estimated based on slope and other stand conditions and are presented for purposes of comparison only. Decisions regarding the long-term maintenance of the DFPZs—including the specific treatment to be used—would be made at the time such maintenance is determined necessary. Selection of one of the action alternatives would not determine what methods would be used for the long-term maintenance of DFPZs.

b. The additional 2 acres of noxious weed control would be conducted by nonchemical methods

3.7.5.2 Alternative B (Proposed Action)

Direct and Indirect Effects. See the HFQLG final supplemental EIS (chapter 3 and appendixes E, F, and G) and the SERA risk assessments for imazapyr and triclopyr for human health effects on workers and the general public (SERA 2003, 2004). These documents are hereby incorporated by reference in their entirety and are summarized in appendix C of this EIS.

The potential hazards to workers and the public associated with herbicide, manual, mechanical, and thermal treatments are discussed above in the “Affected Environment” section. The SERA risk assessments provide information about the risks to human health associated with imazapyr and triclopyr. Comparable risk assessments for manual, mechanical, and thermal treatments are not available, making it difficult to compare the risks of chemical treatments with those of nonchemical treatments. Potential risks of injury from the various treatment methods depend upon the skill and training of the personnel and the complexity and types of equipment used. For instance, prescribed burning requires expensive specialized equipment, training, and experience in accomplishing projects.

On the other hand, herbicide application does not require intensive training, years of experience, or specialized equipment. Therefore, in order to make some quantitative comparisons between alternatives, an estimation of production rates by treatment methods was used to calculate the total number of days required to complete an activity with the assumption that probability of injury or exposure increases the longer a person must work to complete a given task (see table 3-26). The crew size for different treatment methods varies for several reasons, including availability of equipment, Limited Operating Periods, and contract requirements.

Table 3-26. Estimation of production rates and person days by treatment method.

DFPZ Construction (acres)	Acres	Crew Size	Production Acres/day/Person	Total Acres per Day	Total Days	Total Person Days
1. Manual (chainsaw, brush cutters, etc)	87	15	0.25	3.75	23.2	348
2. Mechanical (5 masticators with 5 swampers)	3,671	10	1	10	367.1	3,671
3. Thermal (specialized fire equipment)	661	15	5	75	8.8	132
4. Chemical (batch truck, backpack sprayers)	0	30	2	60	0.0	0
Totals	**4,419**					**4,151**
DFPZ Preventative Maintenance (acres)						
1. Chemical (two 15-person crews)	1,954	30	2	60	32.6	977
Noxious Weed Control (acres)						
1. Manual and Thermal	33	2	0.25	0.5	62.0	124
2. Manual, Thermal, and Chemical	33	2	1	2	15.5	31

DFPZ Construction – DFPZ construction is limited to nonchemical treatment methods. Manual and thermal treatments could be completed within 30 days, limiting exposure to workers and the public. However, mechanical treatments would require over a year to complete all of the treatments (refer to table 3-26). Limited Operating Periods and weather would cause further delays. As shown above on table 3-26, it would take about 4,151 person days to construct 4,419 acres of DFPZs.

DFPZ Preventive Maintenance – DFPZ preventive maintenance is limited to herbicide treatments where the objective is to prevent or reduce the potential for fuel build up. Alternative B proposes to use herbicides on 1,954 acres to control tanoak and other woody vegetation. Under normal operating procedures, if would take two 15-person crews approximately two months to complete the project. It is estimated that the potential risk to workers would be around 977 person days (refer to table 3-26). Appendix C discusses the potential risks of using herbicides.

Noxious Weed Control – The number of days to control noxious weeds ranges from 16 to 62, depending upon the use of herbicides. If herbicides were used, then potential risk would be limited to 31 person days instead of 124 person days. Appendix C discusses the potential risks of using herbicides. For alternative B, herbicides would be used to control noxious weeds, so potential risks to workers and the public would be limited to the 16 days of herbicide application (see table 3-27).

Table 3-27. Comparison of person days, by alternative, for direct and indirect effects.

Total Person Days	Alternatives			
	B and F	C and G	D	E
DFPZ Construction	4,151	4,151	4,151	4,151
DFPZ Preventive Maintenance	977	0	0	977
Noxious Weed Control	31	124	31	124
Total	**5,159**	**4,275**	**4,182**	**5,252**

Cumulative Effects. Alternatives B, E, and F propose herbicide use for preventive maintenance of DFPZs to treat tanoak and brush regrowth within 2 to 3 years of DFPZ construction. None of the action alternatives would determine how, or even if, DFPZs would be maintained long term. Decisions regarding the long-term maintenance of the DFPZs would be made at the time such maintenance is determined necessary. At that time, it would be determined whether or not herbicides would be used for DFPZ maintenance. If the woody vegetation and tanoak in the units exceed the height and density threshold set in the DFPZ maintenance guidelines, then some form of mechanical or thermal treatments would be necessary to remove the accumulated fuels. However, if herbicides could be applied without creating additional standing fuels, then herbicides may be used again as a preventive maintenance strategy. Consequently, if herbicides could be used again as preventive maintenance in the long term, then the total person days for maintaining the DFPZs would be around 3,174 for the 4,419 acres of the DFPZs (see table 3-28).

Table 3-28. Comparison of person days, by alternative, for cumulative effects of DFPZ maintenance.

Treatment Methods	Chemical Methods (acres)	Nonchemical Methods (acres)	Alternatives B, E, and F (person days)[a]	Alternatives C, D, and G (person days)[a]
DFPZ Maintenance (manual)	87	87	348	348
DFPZ Maintenance (mechanical)	1,717	3,671	1,717	3,671
DFPZ Maintenance (thermal)	661	661	132	132
DFPZ Maintenance (chemical)	1,954	0	977	0
Total Acres	**4,419**	**4,419**	**3,174**	**4,151**

Note:

a. Total person days for DFPZ maintenance are estimated based on possible maintenance methods appropriate for slope and other stand characteristics and are presented for comparison purposes only. Decisions regarding specific treatments to be used for the long-term maintenance of the DFPZs would be made at the time such maintenance is determined necessary. Selection of one of the action alternatives would not determine what methods would be used to maintain DFPZs in the long term.

3.7.5.3 Alternative C

Direct and Indirect Effects. For DFPZ construction, alternative C would be the same as alternative B. There would be no DFPZ preventive maintenance with herbicides. Herbicides would not be used for noxious weed control. Noxious weeds would be controlled by hand pulling, cutting, and burning; therefore, it would take about 62 days and around 124 person days to complete the noxious control project (refer to table 3-26 above).

Cumulative Effects. The cumulative effects of this alternative would be similar to alternative B. With reduced fuel loading, ladder fuels, and canopy fuels, there would be a lower risk potential of a stand-replacing wildlife occurring in the project area. Firefighter safety would be enhanced due to lower flame lengths and resistance to control than alternative A. Public safety would also be enhanced for similar reasons. See the "Fire and Fuels" section in this EIS for a detailed discussion.

Alternative C would not make a decision on the future maintenance of the DFPZs. Decisions regarding long-term DFPZ maintenance—including the specific treatments to be used—would be made when the time for maintenance of the natural stands is reached (approximately 10–20 years after initial treatment). However, because herbicides have been shown to be most efficient and effective in delaying or preventing the buildup of understory fuels when used within approximately two years of the initial treatment (HFQLG final supplemental EIS, page 22), herbicide use for preventive maintenance of the DFPZs is essentially precluded under this alternative unless accumulated woody vegetation are first removed by burning or mechanical treatments. A new analysis and decision document would be conducted at that time.

Without using herbicides for long-term DFPZ maintenance, there would be an increased risk of injury to workers due to manual, mechanical, and thermal methods for DFPZ maintenance and noxious weed control. There would be an increased risk to the public from mechanical (fugitive dust) and prescribed burning (smoke particulates) methods for DFPZ maintenance and noxious weed control. It would take about 4,151 person days to complete the 4,419 acres for DFPZ maintenance (refer to table 3-28 above).

The amount of proposed burning treatments would increase in the project area, but implementation would only occur under prescribed fire conditions to manage smoke and with enough personnel present to ensure public safety. Dust would also be generated with project implementation. Tractor and grapple piling would produce the most dust but would be of short duration. Mechanical shredding is not expected to produce large quantities of dust because the shredded material would be left on site as mulch between the equipment and the soil. Some dust could occur when the shredding head occasionally comes in contact with the soil. Most operators try to avoid this because soil and potential rock contact is hard on equipment and increases the need for maintenance and repairs. Noxious weed control would include hand pulling, cutting, and burning.

3.7.5.4 Alternative D

Direct and Indirect Effects. Direct and indirect effects would be the same as those described for DFPZ construction under alternative C, and the same as alternative B for noxious weed control. Alternative D would have the lowest number of person days (4,182) to complete all of the treatments (refer to table 3-27).

Cumulative Effects. The cumulative effects would be same as those described for alternative C for DFPZ long-term maintenance and the same as alternative B for noxious weed control. The total number of person days (4,151) to complete all of the treatments would be the same as alternative C (refer to table 3-28).

3.7.5.5 Alternative E

Direct and Indirect Effects. The effects would be the same as alternative B for DFPZ construction and preventive maintenance and the same as alternative C for noxious weed control. However, the total number of person days to complete all treatments would be slightly higher by 93 person days than alternative B (refer to table 3-27).

Cumulative Effects. Cumulative effects would be the same as those described under alternative B for DFPZ long-term maintenance and the same as alternative C for noxious weed control. The total number of person days (3,174) to complete all of the treatments would be the same as alternative B (refer to table 3-28).

3.7.5.6 Alternative F

Direct and Indirect Effects. The direct and indirect effects would be the same as those described under alternative B for DFPZ construction, DFPZ preventive maintenance, and noxious weed control. The total number of person days (5,159) to complete all of the treatments would be the same as alternative B (refer to table 3-27).

Cumulative Effects. The cumulative effects would be the same as those described under alternative B for DFPZ long-term maintenance and noxious weed control. The total number of person days (3,174) to complete the treatments would be the same as alternative B (refer to table 3-28).

3.7.5.7 Alternative G

Direct and Indirect Effects. The direct and indirect effects would be the same as those described under alternative C for DFPZ construction and noxious weed control. The total number of person days (4,275) to complete all of the treatments would be the same as alternative C (refer to table 3-27).

Cumulative Effects. The cumulative effects would be the same as those described under alternative C for DFPZ long-term maintenance and noxious weed control. The total number of person days (4,151) to complete all of the treatments would be the same as alternative C (refer to table 3-28).

3.7.6 Summary of Cumulative Effects

The proposed use of herbicides could result in cumulative doses of herbicides to workers or the general public. Cumulative doses from the same herbicide would occur from (1) additive doses resulting from various routes of exposure from this project, and (2) additive doses if an individual is exposed to other herbicide treatments. Additional sources of exposure could include use of herbicides on adjacent private land or home use by a worker or member of the general public.

Other agricultural applications (grapes, rangeland, pastureland, landscaping, and right-of-way) were considered during this analysis but were not considered relevant because (1) none of the chemicals used in those applications are known to interact with the herbicides proposed for use in this project, and (2) their occurrence was remote in relation to the project area.

Tables 3-29 and 3-30 list the past use of herbicides (by pound) in the Slapjack Project area. It is assumed that there would not be any extensive changes in these herbicide use patterns into the near future. Herbicides are used primarily for road and utility right-of-way maintenance; rangeland improvement; noxious weed treatments; maintenance of orchards and flowerbeds, parks, and golf courses; and by individual rural home / land owners. Other projects that could potentially involve herbicide use in Yuba and Butte Counties would be expected to be small and scattered, following past trends. Table 3-31 displays the total pounds of active ingredients that were applied in Butte and Yuba Counties between 2000 and 2003. See appendix D of the "Slapjack Project Human Health Risk Assessment Report" for cumulative effects of pesticides applied by watershed, by year.

Table 3-29. Slapjack Project area herbicide use in pounds of active ingredient, by watershed.

Watershed (HUC6)	Slapjack Project	Private and Corporate Lands				
		2004[a]	2003	2002	2001	2000
		Pounds of Herbicides Applied				
Dobbins Creek	7.50		2,715.6	1,871.2	8,137.8	9,239.0
Frey Creek	3.50		25.9	32.7	43.5	16.6
Lower Dry Creek	244.25		476.7	623.6	129.5	1,288.7
McCabe Creek	0.00		86.9	2,818.5	764.7	527.9
New Bullard's Bar Reservoir	345.75		1,560.4	3,410.1	1,800.5	1,858.3
Ponderosa Reservoir	120.00		1,440.6	1,423.3	362.5	829.9
Totals	**721.00b**		**6,306.0**	**10,179.3**	**11,238.6**	**13,760.3**

Note:

a. Not available from the California Department of Pesticide Regulation website at the time of this analysis. Will be completed for the final EIS.

b. The 721 pounds of herbicide (active ingredient) applied equals 31 acres of noxious weed control times 5 years times 1.5 pounds per acre for triclopyr, plus 0.25 pound per acre of imazapyr times 1,954 DFPZ acres.

Table 3-30. Number of acres proposed for herbicide treatment.

Watershed (HUC6)	Slapjack Project	Private and Corporate Lands				
		2004[a]	2003	2002	2001	2000
		Acres Treated				
Dobbins Creek	5		660.0	1,739.0	4,468.0	4,305.0
Frey Creek	14		3.0	61.0	77.0	640.0
Lower Dry Creek	652		403.0	685.0	242.6	1,590.0
McCabe Creek	0		334.0	1,617.0	231.0	462.0
New Bullard's Bar Reservoir	1,283		2,597.0	3,564.0	1,176.0	2,543.5
Ponderosa Reservoir	155		1,764.0	853.0	137.0	775.4
Totals	**2,109[b]**		**5,761.0**	**8,519.0**	**6,331.6**	**10,315.9**

Notes:

a. Not available from the California Department of Pesticide Regulation website at the time of this analysis. Will be completed for the final EIS.

b. The 2,019 acres = 31 acres of noxious weed control times 5 years plus 1,954 acres of DFPZ treatments.

Table 3-31. Total pounds of herbicide (active ingredient) use for Butte and Yuba Counties.

County	2004	2003	2002	2001	2000
	Total Pounds of Herbicide Applied				
Butte County	2,962,209,7	3,062,291.7	2,896,424.7	2,764,335.5	3,480,682.2
Yuba County	1,398,577.2	1,427,355.1	1,432,139.0	972,242.9	1,426,512.1
Totals	**4,360,786.9**	**4,491,649.8**	**4,330,565.7**	**3,738,579.4**	**4,909,194.4**

It is conceivable that workers or members of the public could be exposed to herbicides as a result of treatments on surrounding private lands, as well as from the treatments proposed in this project. Each of the hazard quotients summarized in appendix C of this document involves a single exposure scenario. Where individuals could be exposed by more than one route, the risk of such cases can be quantitatively characterized by simply adding the hazard quotients for each exposure scenario.

This risk assessment specifically considers the effect of repeated exposure in that the chronic RfD (reference dose) is used as an index of acceptable exposure. Consequently, repeated exposure to levels below the toxic threshold should not be associated with cumulative toxic effects.

The Forest Service does not anticipate any additive doses from treatments in subsequent years because these herbicides persist in the environment for a relatively short time (generally less than one year), do not bioaccumulate, and are rapidly eliminated from the body. It is highly unlikely that any residues from a previous herbicide application would still be in place during any subsequent treatments a year later. According to recent work completed by the California Department of Pesticide Regulation, some plant material contained triclopyr residue up to 80 weeks after treatment and glyphosate residue up to 66 weeks after treatment; however, these levels were less than 1 part per million (Cal EPA 2001). Since the proposed treatments in this project would be a minimum of two to three years in the future, it is highly unlikely that any residues from the first application year would still be in place during the second or third year.

3.8 Hydrology

3.8.1 Regulatory Framework

3.8.1.1 Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement and Record of Decision

Table 2 of the 2004 *Record of Decision on the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement* (SNFPA final supplemental EIS) describes the standards and guidelines applicable the Herger-Feinstein Quincy Library Group (HFQLG) Pilot Project area for the life of the Pilot Project (USDA Forest Service 2004). No standards and guidelines specific to riparian areas, hydrology, or water resources are mentioned in table 2. The Record of Decision directs that vegetation management projects in the Pilot Project area follow the direction of the HFQLG Forest Recovery Act (HFQLG Act) in the application of Scientific Analysis Team guidelines.

3.8.1.2 Herger-Feinstein Quincy Library Group Forest Recovery Act

The HFQLG Act direction is to apply the Scientific Analysis Team guidelines for riparian system protection for all resource management activities conducted and all timber harvesting activities that occur in the Pilot Project area during the term of the Pilot Project. The HFQLG Act states that Streamside Management Zone (SMZ) requirements would continue to be the governing riparian management standards and guidelines in all portions of the planning area, except for the Pilot Project areas where resource management activities or any timber harvesting activities in the Pilot Project area are implemented. The prescribed minimum widths of “interim boundaries” in Riparian Habitat Conservation Areas (RHCAs) are

- 300 feet (perennial fish-bearing streams and lakes);
- 150 feet (perennial nonfish-bearing streams, ponds, wetlands greater than 1 acre, and lakes); and
- 100 feet (intermittent and ephemeral streams, wetlands less than 1 acre, and landslides).

The features to use in RHCA width determination (whichever is greatest) are (1) top of inner gorge, (2) 100-year floodplain, (3) outer edge of riparian vegetation, and (4) a distance equal to one or two tree heights. The Feather River Ranger District silviculturist has determined the average height of a site potential tree to be 150 feet. This means a 150-foot RHCA buffer width is applied to seasonally flowing streams (intermittent or ephemeral) that have a definable channel and evidence of annual scour and deposition. These widths would be applied until a watershed analysis is completed. RHCA management guidelines would apply within the protection area. Scientific Analysis Team guidelines would supersede other direction, unless conflicting direction would provide greater protection to riparian and fish habitat or would better achieve Riparian Management Objectives. For more detailed information, refer to appendices A and B of the “Hydrology Report” in the project record and appendix F of this EIS.

3.8.1.3 Plumas National Forest Land and Resource Management Plan

The 1988 *Plumas National Forest Land and Resource Management Plan* (commonly referred to as the "Forest Plan") has been amended by more recent programmatic documents, including the 2004 SNFPA Record of Decision and the HFQLG Act Record of Decision, but it still applies where not amended. Also some goals, policies, and guidelines still apply to riparian management (USDA Forest Service 1988).

The Forest Plan guidelines are applied to streams where Scientific Analysis Team guidelines from the HFQLG Act are not applicable. Ephemeral channels with no evidence of annual scour and deposition are abundant on the west side of the forest. These channels meet the HFQLG Act final EIS definition of ephemeral swales. These channels may only flow during large magnitude flow events (such as the 2-year or 10-year events), and are generally headwater areas that were altered during past landscape disturbance, including logging and stand establishment activities or mining. Ephemeral swales are not protected under HFQLG guidelines; however, ground-based equipment restrictions are needed to ensure further alteration does not occur. For these types of streams, Streamside Management Zone (SMZ) widths are applied. Within these protections zones, treatment may still occur; however, ground-based equipment is excluded.

The Forest Plan requires the adoption of and adherence to a SMZ plan for any activity within a SMZ. While the Slapjack Project is designed to restrict activities in SMZs and RHCAs, there may be limited exceptions. In accordance with the Forest Plan requirement, a "Streamside Management Zone Plan" has been prepared and is included as appendix B of the "Hydrology Report." The plan refers to this regulatory framework section as it applies to SMZs and RHCAs. It describes in some greater detail the application of Best Management Practices and standards and guidelines to the Slapjack Project.

3.8.1.4 California State Water Resources Control Board, Federal Clean Water Act, and Porter-Cologne Water Quality Control Act

The *Porter-Cologne Water Quality Control Act*, which is contained in Division 7 of the California Water Code, establishes the responsibilities and authorities of the State Water Resources Control Board, with a mandate to balance, to the extent possible, all uses of California's water resources be they domestic, agricultural, or environmental and of each Regional Water Quality Control Board, including authority and responsibility for regional water quality control and planning (USDA Forest Service Plumas National Forest 2002b).

The *Clean Water Act of 1972*, as amended in 1977 and 1980, establishes goals, policies, and procedures for the maintenance and improvement of the nation's waters. It addresses both point and nonpoint sources of pollution and establishes or requires programs for the control of both sources of pollution. Section 208 requires area-wide waste treatment management plans and water quality management plans for nonpoint sources of pollution. The act established specific roles for federal, state, and local authorities in the regulation, enforcement, planning, control, and management of water pollution. More directly, Section 319 addresses nonpoint source pollution and also requires development of water quality management plans. The *Clean Water Act* requires the states or the U.S. Environmental Protection Agency (EPA) to set standards for surface water quality, mandate sewage treatment, and regulate wastewater discharges into the nation's surface waters. The State Water

Resources Control Board assumed responsibility for implementing the *Clean Water Act*. This involved melding state and federal processes together for activities such as setting water quality standards and issuing discharge permits. The Central Valley Regional Board establishes water quality objectives and programs to implement those objectives by amending the Central Valley Region's Water Quality Control Plan (hereinafter referred to as the "Basin Plan") for the Sacramento and San Joaquin River basins.

Land management activities have been recognized as potential sources of nonpoint water pollution. By definition, nonpoint pollution is not controllable through conventional treatment plants; rather, nonpoint pollution is controlled by containing the pollutant at its source, thereby precluding delivery to surface water. Sections 208 and 319 of the *Clean Water Act* (Public Law 92-500), as amended, acknowledge land treatment measures as being an effective means of controlling nonpoint sources of water pollution and emphasize their development. Working cooperatively with the State Water Resources Control Board, the Forest Service has developed and documented nonpoint pollution control measures applicable to National Forest System lands. These measures have been certified by the state and approved by the EPA as the most effective means the Forest Service could use to control nonpoint source pollution. These measures were termed "Best Management Practices" (BMPs), which include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters. BMPs are usually applied as a system of practices rather than as a single practice. BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility. BMPs are basically a preventive rather than an enforcement system. The BMPs that apply to the Slapjack Project are included in appendix F of this EIS.

3.8.1.5 Section 303(d) of the Clean Water Act

Section 303(d) of the *Clean Water Act* requires the identification of water bodies that do not meet, or are not expected to meet, water quality standards or are considered impaired. The affected water body, and associated pollutant or stressor, is then prioritized in the 303(d) list. The *Clean Water Act* further requires the development of a Total Maximum Daily Load (TMDL) for each listing. The current list, approved by the EPA, is the 2002 303(d) list. In the area analyzed for cumulative watershed effects, the watershed area that contributes to Englebright Reservoir is listed as impaired for mercury. The source of mercury is listed as resource extraction related to abandoned mines, with a medium TMDL priority. The Feather River downstream of Oroville Dam is listed as impaired by Diazinon™, an agricultural pesticide, with a high TMDL priority. There are no sources of Diazinon™ located upstream of the dam, and no restrictions or TMDLs apply within the project or hydrologic analysis area.

3.8.1.6 Regional Water Quality Control Board – Central Valley Region – Beneficial Uses and State Water Quality Objectives

Beneficial uses are defined under California State law in order protect against degradation of water resources and to meet state water quality objectives. The Forest Service is required to protect and enhance existing and potential beneficial uses during water quality planning (California Regional Water Quality Control Board [CRWQCB] 1998). Beneficial uses of surface water bodies, including those that may be affected by activities on the Plumas National Forest, are listed in chapter 2 of the

Basin Plan (CRWQCB 1998). All listed beneficial are already in existence; there are no "potential" beneficial uses defined for these water bodies. Existing beneficial uses are defined for the Middle Fork Feather River and its tributaries, for Lake Oroville, for the watershed areas that are sources to Englebright Reservoir on the Yuba River, and for the Yuba River downstream of Englebright Reservoir. Beneficial uses are not defined for the South Fork Feather River but are assumed to include all the same beneficial uses as the others listed. Beneficial uses include municipal and domestic water supplies, agricultural supply, hydropower generation, water contact recreation, noncontact water recreation, commercial and sport fishing, warm freshwater habitat, cold freshwater habitat, wildlife habitat, and spawning, reproduction, and/or early development.

Post-project monitoring of BMPs will ensure that the intent of these regulations is achieved, and that state water quality objectives are met. The relevant water quality objectives and BMPs are listed in appendix B of the "Hydrology Report." Water quality objectives, BMPs, and other management requirements for proposed herbicide use are discussed in appendix F of this EIS. With respect to the water quality impairment of Englebright Reservoir sources by mercury from abandoned mines, there are few abandoned mine sites within the Slapjack Project area, and no mitigation measures are currently anticipated for mercury discharge from this portion of the North Yuba River watershed. For more detailed information, refer to the "Hydrology Report" in the project record.

3.8.2 Methodology for Assessing Impacts on Hydrology

3.8.2.1 Scope of Analysis

The scope of the Equivalent Roaded Area (ERA) hydrologic analysis includes 42 subwatersheds ranging from 503 acres to 4,793 acres, with a total analysis area of 66,247 acres (see table 3-32). The locations of watersheds with respect to treatment units are displayed in figure 3-4. Subwatersheds 3 and 20 are located in the analysis area, but treatments would not occur within their boundaries. The major rivers in the analysis area include the Middle Fork Feather River, the South Fork Feather River, and the North Yuba River. The Middle Fork and South Fork Feather River drain into Lake Oroville, the Feather River and the various conveyances of the State Water Project. The North Yuba River drains into Bullard's Bar Reservoir. Subwatersheds 1, 2, 3, 4, 9, 10, 17, 18, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, and 42 eventually drain into Lake Oroville. Subwatersheds 5, 6, 7, 8, 11, 12, 13, 14, 15, 16, 37, 38, 39, 40, and 41 eventually drain into Bullard's Bar Reservoir. Subwatersheds 19, 20, 21, 22, and 25 drain to the Yuba River downstream of Englebright Reservoir.

3.8.2.2 Herbicide Effects Assessment

The scope of analysis for direct and indirect effects of herbicide application is limited to the Slapjack Project area. The scope of the hydrologic analysis for cumulative effects of proposed herbicide application differs from the scope for the cumulative watershed effects analysis. A larger area was analyzed for the existing condition of herbicide use. The existing condition analysis is based on pesticide use data compiled by California Department of Pesticide Regulation and was tabulated by Hydrological Unit Code (HUC)6 watershed for the herbicide risk assessment. The area encompassed by the six HUC6 watersheds that intersect the Slapjack Project area was queried for pesticide use, and these HUC6 watersheds were analyzed for the potential cumulative effects of proposed herbicide application. The HUC6 watersheds that were analyzed are listed in tables 3-28 and 3-29 of the "Human Health and Safety" section (3.7) of this EIS.

Table 3-32. Watersheds located in the cumulative watershed effects analysis area.

HFQLG[a] Number	HUC6 Name	HUC6 ID Number	Subwatershed Name	Subwatershed Label	Subwatershed Area A[b] (acres)	Subwatershed Area B[c] (acres)	Subwatershed Total Area (acres)
110015	McCabe Creek	180201230701	Nutmeg Creek	1	166.00	755.40	921.40
	McCabe Creek	180201230701	Kanaka Creek	2	276.00	600.70	876.70
	Ponderosa Reservoir	180201230603	Woodleaf Creek	3	250.80	1,175.00	1,425.80
	Ponderosa Reservoir	180201230603	Oroleve Creek	4	472.50	1,491.00	1,963.50
110010	New Bullard's Bar Reservoir	180201250203	Hampshire Creek	5	239.50	956.10	1,195.60
110007	New Bullard's Bar Reservoir	180201250203	Empire Creek	6	284.90	1,084.00	1,368.90
110007	New Bullard's Bar Reservoir	180201250203	Indian Creek	7	428.50	1,835.00	2,263.50
110007	New Bullard's Bar Reservoir	180201250203	Slapjack Creek	8	479.90	2,069.00	2,548.90
	New Bullard's Bar Reservoir	180201250203		9	115.80	493.00	608.80
	New Bullard's Bar Reservoir	180201250203	Internal Drainage New Bullard's Bar Reservoir	10	2,105.00	1,781.00	3,886.00
110003	New Bullard's Bar Reservoir	180201250203	Burnt Bridge Creek	11	305.70	1,323.00	1,628.70
110003	New Bullard's Bar Reservoir	180201250203		12	161.40	749.70	911.10
	New Bullard's Bar Reservoir	180201250203	Cottage Creek	13	147.50	771.70	919.20
	Dobbins Creek	180201250501	Chute Ravine	14	144.40	1,275.00	1,419.40
	Dobbins Creek	180201250501	Dobbins Creek	15	58.29	766.30	824.59
	Dobbins Creek	180201250501	Dobbins Creek	16	44.80	558.50	603.30
110006	Lower Dry Creek	180201250701		17	235.90	1,465.00	1,700.90
110006	Lower Dry Creek	180201250701		18	268.60	906.10	1,174.70
110006	Lower Dry Creek	180201250701	Internal Drainage Dry Creek	19	316.30	1,269.00	1,585.30
110006	Lower Dry Creek	180201250701		20	42.35	550.60	592.95
110006	Lower Dry Creek	180201250701	Golden Gate Ravine	21	224.40	896.50	1,120.90
110006	Lower Dry Creek	180201250701	Internal Drainage Costa Creek	22	524.60	1,800.00	2324.60
110003	New Bullard's Bar Reservoir	180201250203	Internal Drainage Little Oregon Creek	23	419.60	1,390.00	1,809.60
110003	New Bullard's Bar Reservoir	180201250203	Internal Drainage Little Oregon Creek	24	406.70	1,957.00	2,363.70
	Lower Dry Creek	180201250701		25	210.10	948.10	1,158.20
110012	Ponderosa Reservoir	180201230603	Forbestown Ravine	26	172.00	658.30	830.30
110012	Ponderosa Reservoir	180201230603	Internal Drainage Ponderosa Reservoir	27	313.80	1,255.00	1,568.80

Table 3-32. Watersheds located in the cumulative watershed effects analysis area (continued).

HFQLG[a] Number	HUC6 Name	HUC6 ID Number	Subwatershed Name	Subwatershed Label	Subwatershed Area A[b] (acres)	Subwatershed Area B[c] (acres)	Subwatershed Total Area (acres)
110012	Ponderosa Reservoir	180201230603		28	126.90	395.90	522.80
110012	Ponderosa Reservoir	180201230603		29	125.00	442.60	567.60
110012	Ponderosa Reservoir	180201230603	Internal Drainage South Fork Feather River	30	658.50	2,372.00	3,030.50
110012	Ponderosa Reservoir	180201230603		31	69.30	491.50	560.80
	Frey Creek	180201230702	McCabe Creek	32	449.00	2,498.00	2,947.00
	Frey Creek	180201230702		33	68.43	434.70	503.13
	Frey Creek	180201230702	Internal Drainage Lake Oroville	34	1,966.00	2,827.00	4,793.00
	Ponderosa Reservoir	180201230603	Little Sucker Run	35	226.30	1,113.00	1,339.30
	Ponderosa Reservoir	180201230603	Internal Drainage Sucker Run Creek	36	830.80	2,078.00	2,908.80
110019	New Bullard's Bar Reservoir	180201250203	Owl Gulch	37	264.20	1043.00	1,307.20
110019	New Bullard's Bar Reservoir	180201250203	Internal Drainage Dogwood Creek	38	594.80	1,921.00	2,515.80
110010	New Bullard's Bar Reservoir	180201250203	Internal Drainage North Fork Feather River	39	566.40	1,607.00	2,173.40
	New Bullard's Bar Reservoir	180201250203	Internal Drainage New Bullard's Bar Reservoir	40	970.40	1,318.00	2,288.40
	New Bullard's Bar Reservoir	180201250203	Internal Drainage North Yuba River	41	170.60	1,020.00	1,190.60
	New Bullard's Bar Reservoir	180201250203	Internal Drainage North Yuba River	42	878.70	2,125.00	3,003.70

Notes:

a. HFQLG = Herger-Feinstein Quincy Library Group.

b. Area A = near-stream sensitive areas (all RHCAs).

c. Area B includes all other areas in the subwatersheds.

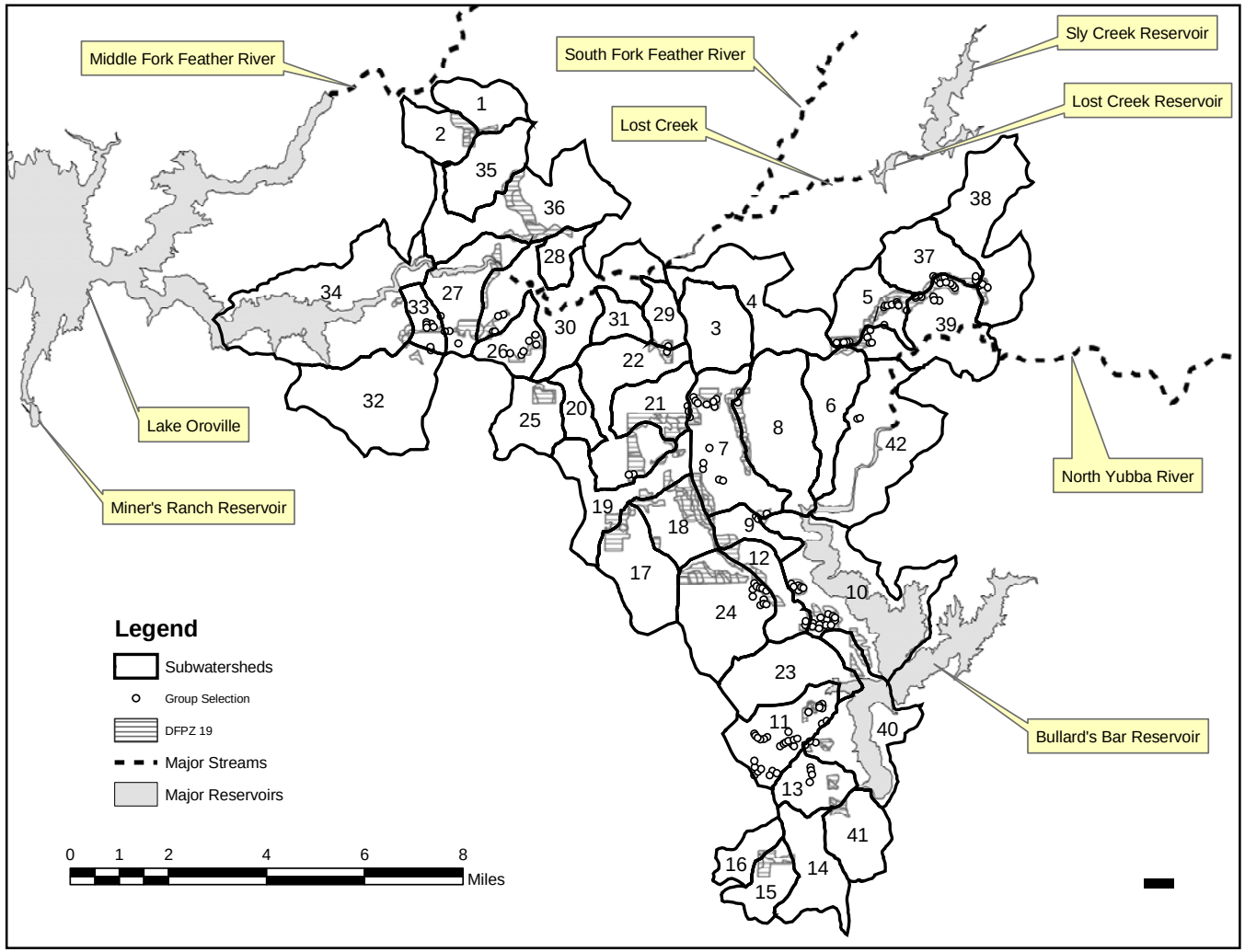

Figure 3-4. Locations of subwatersheds with respect to treatment units.

3.8.2.3 Indicators

Indicator 1: Watershed Condition

Measure 1 — Cumulative Watershed Effects Analysis. The effects of roads, landings, timber harvesting activities on public and private lands, wildland fire, grazing, residential areas, recreation areas, power lines, dams, penstocks to hydrologic facilities, mines, and quarries on off-site water quality and stream channel stability were assessed using the Region 5 Cumulative Watershed Effects Methodology. This method uses "Equivalent Roaded Areas" (ERAs) measured in acres. Watersheds and their associated stream systems can tolerate given levels of land disturbance, but there is a point when land disturbances begin to substantially impact downstream channel stability and water quality. This upper estimate of watershed "tolerance" to land use is called the Threshold of Concern (TOC). ERAs of near-stream sensitive areas, and the subwatersheds as a whole, are compared to the TOC and reported as percent disturbed and percent of TOC. Near-stream sensitive areas include all RHCAs identified in the analysis area. If the percent of TOC is 80–99 percent, then the watershed condition is approaching the TOC. If the percent of TOC is 100 percent, then the watershed condition is at the TOC, and if it is greater than 100 percent, then the watershed condition is over the threshold TOC. The TOC does not represent an exact level of disturbance where cumulative watershed effects will occur. Rather, it serves as a "yellow flag" indicator of increased risk of significant adverse cumulative effects occurring within a watershed. Streams located within Defensible Fuel Profile Zone (DFPZ) treatments units were field-checked by Forest Service hydrologists, and field results were compared to model results.

Measure 2 — Herbicides and Water Quality. The analyses of possible effects of herbicide application are derived from the effects analyses performed for the HFQLG final supplemental EIS (USDA Forest Service 2003a), where detailed discussion of the effects of herbicides for DFPZ maintenance is presented. The final supplemental EIS does not discuss the effects of herbicides for noxious weed control, but it does address ground application of triclopyr, and this discussion is incorporated in the analysis of proposed use of triclopyr for noxious weed control in the Slapjack Project. Additional information from the SERA (Syracuse Environmental Research Associates, Inc.) risk assessments (SERA 2003, 2004b) is used to discuss the potential effects of the chemical formulations for DFPZ maintenance and noxious weed control.

3.8.2.4 Analysis Methods

Cumulative Watershed Effects Analysis. The following definitions apply when assessing the direct, indirect, and cumulative watershed effects (CWE) condition:

Direct effects on watershed conditions result when activities occur in RHCAs and watercourses. The causes of increased erosion and sedimentation directly into stream courses include road maintenance and/or construction, fireline construction and reconstruction for prescribed burning, wildland fires, and timber management activities, such as construction of skid trails, temporary roads, and log landings.

Indirect effects can occur when upland watershed areas are disturbed by soil compaction, removal of vegetation canopy, hillslope destabilization, and/or detachment and mobilization of sediment related to disturbance from timber harvest or associated activities. Indirect effects would be

experienced at the scale of those segments of the channel network in or adjacent to the treatment units and would be consequences of project activities. The results of indirect effects include increased peak channel flows, alteration of annual flow distribution, increased erosion and sedimentation, stream channel geometry alteration, and degradation or aggradation of channel beds, resulting in detrimental impacts on stream proper function and condition, water quality, and stream and riparian habitat quality.

Cumulative watershed effects (CWEs) include any changes that involve watershed processes and are influenced by multiple land use activities (Reid 1993). They do not represent a new type of impact. Changes that accumulate in time or space are considered CWEs. The definition of a CWE from the Council on Environmental Quality regulations (40 CFR 1508.7) states: "Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Land use activities alter environmental parameters—they modify topography; change the character of soil and vegetation; import or remove water, chemicals, and fauna; and they introduce pathogens and heat. Changes in these parameters can cause changes in watershed processes. As the watershed changes in response to the altered environmental parameters, changes in production and transport of water, sediment, organic matter, chemicals, and heat occur (Reid 1993). Land use can cause on-site CWEs which result directly from on-site changes in environmental parameters or off-site CWEs that are the result of changes in watershed transport processes.

The Forest Service Region 5 Cumulative Watershed Effects Methodology (ERA model) was used to assess the effects on off-site water quality and stream channel stability. The ERA model, measured in acres, serves as an index to measure the impact of past, present, and future land management activities on downstream water quality. More specifically, ERA describes these off-site impacts in terms of the area roaded within a watershed. It assumes that the more densely a watershed is roaded, the greater the impacts will be to water quality downstream. Watersheds and their associated stream systems can tolerate given levels of land disturbance, but there is a point when land disturbances begin to substantially impact downstream channel stability and water quality. This upper estimate of watershed "tolerance" to land use is called the Threshold of Concern (TOC). At levels above the TOC, water quality may be impaired such that the water is no longer available for established beneficial uses, such as municipal water supplies or irrigation, or no longer provides adequate habitat for fisheries. Stream channels can deteriorate to the extent that riparian and meadowland areas become severely damaged. The ERAs of near-stream sensitive areas, and the subwatersheds as a whole, are compared to the TOC and reported as percent disturbed and percent of TOC. For a detailed discussion on the methodology for the ERA model, refer to appendix C of the "Hydrology Report."

Stream channels located within DFPZ treatments units were identified in the field as RHCAs or SMZs. RHCAs are streams with evidence of annual scour, and SMZs are ephemeral channels without annual scour (refer to appendix B of the "Hydrology Report" for explanations of RHCAs and SMZs). Each stream section was identified with a number, and each location was marked using a Global Positioning System (GPS). This information was used to map streams with a Geographic Information System (GIS) to create a near-stream sensitive area layer that will be used during layout of treatment units on the ground. Each RHCA in plantation units received a site visit to determine treatments

needed to enhance RHCA conditions (for detailed information on RHCA and SMZ treatments, refer to appendix A of the "Hydrology Report"). The hydrologists conducted surveys in more detail to assess the condition of streams in RHCAs (streams with annual scour) that are located in DFPZ treatments units in order to compare those conditions with the ERA model results. The majority of the DFPZ treatment units either contained no stream channels, or they contained stream channels with no evidence of annual scour (ephemeral swales). All of the information was gathered during the spring and summer field season of 2004.

3.8.2.5 Herbicides Effects Analysis

The existing condition of herbicide use and presence in the analysis area is derived from the California Department of Pesticide Regulation data. It is assumed that hydrologically transmitted direct and indirect effects within the Slapjack Project boundary are largely nonexistent or insignificant because no herbicides have been applied on Plumas National Forest lands since 1983, with the exception of the Challenge Experimental Forest. Cumulative effects are potentially present and associated with adjacent private ownership where various pesticide treatments are applied. The quantities of chemicals applied and acres treated are summarized below in section 3.8.3. These quantities are detailed by product, application method, watershed, and type of use in appendix C of this EIS. A variety of chemicals for agricultural and silvicultural application are used on private timber and agricultural lands in the analysis area. It is not practical to quantitatively predict the environmental fate and cumulative toxicological effects of these various applications. Private landowners are required to comply with state and federal laws governing pesticide use. These regulations include buffers to surface waters that generally preclude detectable or toxic concentrations of herbicides from entering surface waters or adversely affecting aquatic habitat or organisms. Private timber harvest plans filed in the analysis area indicate that no significant water quality or toxicological effects are anticipated to occur as the result of silvicultural herbicide use. Therefore, while the quantity and distribution of herbicides applied in the analysis area are documented, it is assumed that the risk of detrimental cumulative effects from herbicide application in the analysis area would be low to nonexistent.

3.8.3 Affected Environment (Existing Conditions): Hydrology

3.8.3.1 Overview

The subwatersheds that make up the hydrologic analysis area are listed above in table 3-32 and displayed in figure 3-4. The existing condition information on these subwatersheds is based on site visits, historical references, aerial photography, Forest Service cooperate data, the cooperate data from Butte and Yuba Counties, and private land timber harvest plans. The subwatersheds lie within a mostly forested rural landscape on the western slope of the northernmost Sierra Nevada of California. Nearly two-thirds of the subwatersheds in the analysis area have a majority of private ownership (refer to table 3-32 above). Land ownership in subwatersheds 1, 2, 4, 6, 8, 10, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 29, 32, 34, 35, 36, 37, 40, 41, and 42 is greater than 50 percent private. Overall, 62 percent of the CWE analysis area is privately owned.

The productive nature of forest soils in the area and the climate conditions have ensured that forest vegetative cover remains dense and vigorous. The western slope of the northernmost Sierra

Nevada, which includes the Feather River Ranger District, receives the greatest amounts of mean annual precipitation in the range. The climatic regime is Mediterranean. Precipitation is concentrated between November and April, and drought conditions generally prevail the remainder of the year. The southwesterly aspect of the drainage network, which favorably intercepts Pacific storm energy and the orographic influence of the rise of the western slope of the Sierra Nevada, are the chief factors that account for the precipitation conditions. Mean annual precipitation in the area ranges from around 40 inches at Lake Oroville to approximately 75 inches in the headwaters of Deadwood Creek and on Peterson Ridge in the northeastern most portion of the analysis area. Because of the relatively low elevation of the area, no more than 20 percent of the annual precipitation falls as snow (California Department of Water Resources [CDWR] 1978). Mean annual runoff exceeds 40 inches per year (CDWR 1978), and 70 percent of annual precipitation appears as stream runoff (Benoit 1980). Because of the elevation of the analysis area, streamflow is typically storm flow-dominated throughout the fall and winter rainy season. T he average monthly runoff peaks occur in December through February and decline to a monthly low in September. Rain-on-snow or rain-on-frozen-ground events occur infrequently over the analysis area but have a high potential for destructive flooding. The landscape setting and conditions that currently exist in the analysis area, including the physiographic and geologic framework, are described in the “Soils Effects Analysis Report.”

Field data was collected to determine stream conditions in the CWE analysis area. The watersheds have been heavily influenced by past logging activities, roads, mining, wildland fires, urban development, and hydroelectric facilities. These influences have modified the stream condition, which has resulted in alteration of flow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, and riparian condition in watersheds. In site-specific locations, streams are continuing to be degraded, mostly due to poor road locations. Some of these locations include headwater channels in the Big Hill area, northeast along the ridgeline across the headwaters of Hampshire Creek, Missouri Creek, and Gophner Ravine. Channel enlargement and instability is evident in these areas, and channels without annual scour may be evidence of channel network headward extension as a result of past land disturbance. Channel instability is also evident in plantation areas north of Challenge that were heavily disturbed during treatments on the Challenge Experimental Forest. In the analysis area, there are 26 miles of perennial fish-bearing streams, 55 miles of perennial nonfish-bearing, intermittent, and ephemeral streams with annual scour, and 136 miles of ephemeral swales.

The Slapjack Project cumulative watershed effects analysis area has a high road density, high road density near streams, and high stream crossing density, which are problems in the watershed area under the existing condition. Roads modify drainage networks and accelerate erosion processes, resulting in the alteration of physical processes in streams. These changes can be dramatic and long lasting and can degrade water quality and aquatic habitat. Roads can directly affect water quality and aquatic habitat by altering flow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, and riparian conditions in watersheds (USDA Forest Service 1991). Common problems on roads include rutting, blocked drainages, lack of drainage structures with proper placement, in accordance with BMPs, and entrenchment of roads. The majority of the subwatersheds have a road density that does not meet the desired condition for minimizing road impacts on aquatic and riparian environments (USDA Forest Service 2003a). The road densities for near-stream sensitive areas range from 0.3 mile to 7.7 miles

per square mile, with an average of 4.5. The road densities of the subwatersheds, as a whole, range from 1.2 to 8.4 miles per square mile, with an average of 5.7.

The existing condition of meadows ranges from good to adversely affected, depending on meadow location, degree of disturbance, and previously accomplished restoration activities. The adverse effects on meadows in the analysis area include stream destabilization within the meadows, invasion of meadows by conifers caused by fire suppression and/or disturbance from past logging practices, soil erosion from roads, season-long cattle grazing, off-highway vehicle (OHV) use, and other disturbance from past timber harvests. The net detrimental effect of many of these disturbances has been a decline in water table elevations within meadows, which experience seasonally saturated conditions when properly functioning. These declines in the areal and temporal extent of seasonal saturation have negatively affected the unique hydrologic and ecologic characteristics of meadows, and are acting to move them to later successional stages resembling disturbed areas of the surrounding forest.

3.8.3.2 Watershed History of Disturbance

Timber harvesting, road construction, and residential development have been the major recent land-disturbing activities in the watersheds. Historic gold mining, unmanaged timber harvest, grazing of both cattle and sheep, and an increase in fire frequency and magnitude all produced changes on the landscape prior to Forest Service management of the area. The decrease in canopy cover of mature timber and replacement with brush fields, as a combined consequence of these activities, may have altered hydrologic response and accelerated erosion and sedimentation during this era. Following National Forest proclamation in the early 1900s, a period of hydrologic recovery ensued, along with resource management and fire suppression. Extensive logging and road building began in the 1950s and 1960s, on both National Forest System and private lands in the analysis area. Routine road location and logging practices of that time resulted in extensive watershed damage that required 20 to 30 or more years to recover. Changes in timber practices alleviated disturbance to a degree by the 1970s, although large volumes of timber continued to be harvested on the National Forest into the 1980s, and substantial private timber harvest continues today. Until recently, most logging activities have occurred on the gently to moderately sloping ground that occupies broad ridge top areas in the watershed. Most of the very steeply sloping areas were not historically harvested, but recent harvest activities using cable and helicopter logging systems have begun removing timber on steeper ground.

Fire suppression and reduced vegetation management have resulted in extensive fuel accumulations, which the Slapjack Project is designed to alleviate. While stand-replacing fire has been relatively uncommon on the western slope of the Plumas National Forest, several historic stand-replacing fires have occurred in the watershed. Fire history is described in the “Fire and Fuels” section (3.5) of this EIS.

Other influences that have impacted the subwatersheds include grazing, mining, urban development, and hydroelectric facilities associated with the State Water Project.

Restoration projects have occurred on Plumas National Forest lands. These restoration projects were designed to reduce and restore stream destabilization from past management activities. A list of these projects is located in appendix F of the “Hydrology Report.”

3.8.3.3 Existing Condition of Indicator 1: Watershed Condition

Measure 1. Table 3-33 includes the total ERA score and the final results for each subwatershed, represented as percent disturbed and percent of TOC for both near-stream sensitive areas and the subwatershed as a whole.

Subwatersheds approaching or over the TOC are indicated in Table 3-33. For the near-stream sensitive areas, there are 2 subwatersheds approaching the TOC and 24 above the TOC under the existing condition. Possible reasons for this are (1) prior to Scientific Analysis Team guidelines, stream protection zones were smaller than present riparian management areas, (2) private timberland has smaller and less stringent protection zones than public lands, and (3) urban development and hydroelectric facilities impact portions of riparian areas. For the entire subwatersheds, eight approach TOC and 11 exceed TOC. In the subwatersheds that exceed threshold of concern, private land harvest activities are the major contributor to the high ERA scores, followed by roads and urban development. Subwatersheds 3 and 20 exceed TOC, but do not have any proposed Forest Service activities. However, other activities within these watersheds contribute to the risk of downstream cumulative effects.

Stream condition surveys were conducted in RHCAs located within DFPZ treatment units. Surveys were conducted in subwatersheds under, approaching, and exceeding TOC. Information gathered was used to compare to the ERA model results. Some of the streams surveyed have had cumulative impacts from past disturbances and have experienced new cumulative effects from timber harvesting on private land, roads, and urban development. Streams reaches with cumulative impacts have sections of unstable and bare banks, head cuts, channel incision, and/or channel widening. Refer to the “Hydrology Report” for more specific information.

Measure 2 – Herbicides and Water Quality. The presence, persistence, and mobility of herbicides on the landscape and in surface waters in the analysis area, as defined above in the “Scope of Analysis” section, are important in determining if there would be significant risk of detrimental impacts on human health and ecological integrity. No herbicides have been applied for silvicultural treatments on the Plumas National Forest since 1983 (Mateyka, pers. comm., 2006), with the exception of any treatments applied in the Challenge Experimental Forest. At present, data are not available for any Experimental Forest application; these data will be sought for the Slapjack Project final EIS.

Agricultural and silvicultural application of herbicides occurs on private lands in the analysis area. Tables 3-28 and 3-29 in the “Human Health and Safety” section (3.7) display the past use in the Slapjack Project area.

It is not practical to model the quantities and concentrations of these chemicals that may be transported through the air, soil, surface water, or groundwater from outside the project boundary. In practice, most chemicals listed are not environmentally persistent and would likely not be detected a short period after application. Monitoring results indicate that silvicultural herbicides that were analyzed are seldom detected in surface waters following application, with the exception of hexazinone. Hexazinone was recently applied in the analysis area (in 2003; 2004 data is not yet available) but in small quantities. It is unlikely that hexazinone would be detectable in surface waters in the Slapjack Project area. Monitoring would be conducted to determine the existing condition of herbicide presence in surface water, groundwater, and soils in the project area, prior to any application of herbicides, in order to establish the baseline condition and to assess the risk of cumulative effects.

Table 3-33. Existing condition ERA compared to TOC, by subwatershed.

Subwatershed Label	TOC of Entire Watershed	Total ERA (in acres)		Percent Disturbed		Percent of TOC	
		Area A[a]	Total	Area A[a]	Total	Area A[a]	Total
1	13	11.48	90.23	6.92	9.79	115.26	75.33
2[b]	12	25.48	95.97	9.23	10.95	153.86	91.22
3[b]	12	27.38	254.48	10.92	17.85	181.95	148.74
4[b]	12	74.77	332.35	15.82	16.93	263.74	141.05
5	14	6.33	48.92	2.64	4.09	44.05	29.23
6[b]	14	28.77	172.18	10.10	12.58	168.30	89.84
7	14	24.02	153.94	5.61	6.80	93.43	48.58
8	14	38.25	267.55	7.97	10.50	132.84	74.98
9	12	3.67	32.20	3.17	5.29	52.82	44.08
10	14	3.65	49.72	0.17	1.28	2.89	9.14
11	14	17.31	89.25	5.66	5.48	94.37	39.14
12	14	10.17	64.03	6.30	7.03	105.02	50.20
13[b]	14	16.63	112.26	11.27	12.21	187.91	87.23
14[b]	14	21.00	184.68	14.54	13.01	242.38	92.94
15[b]	14	6.05	128.07	10.38	15.53	172.99	110.94
16[b]	14	9.28	87.68	20.71	14.53	345.24	103.81
17[b]	14	33.89	205.84	14.37	12.10	239.44	86.44
18	14	9.73	48.54	3.62	4.13	60.37	29.52
19[b]	14	69.31	330.61	21.91	20.85	365.21	148.96
20[b]	14	13.39	136.41	31.62	23.01	527.05	164.33
21[b]	14	42.75	190.29	19.05	16.98	317.51	121.26
22[b]	14	127.30	475.00	24.27	20.43	404.45	145.96
23	14	25.79	192.97	6.15	10.66	102.44	76.17
24[b]	14	56.93	303.40	14.00	12.84	233.30	91.68
25[b]	14	30.74	169.42	14.63	14.63	243.89	104.49
26[b]	12	17.36	129.57	10.09	15.61	168.22	130.04
27	12	10.01	67.21	3.19	4.28	53.17	35.70
28	12	2.94	9.40	2.32	1.80	38.61	14.98
29[b]	12	50.89	107.01	40.71	18.85	678.53	157.11
30	12	13.77	134.00	2.09	4.42	34.85	36.85
31	12	1.40	36.33	2.02	6.48	33.67	53.99
32	12	16.44	258.24	3.66	8.76	61.02	73.02
33	12	2.58	19.43	3.77	3.86	62.84	32.18
34	12	43.01	229.08	2.19	4.78	36.46	39.83
35	12	14.12	110.84	6.24	8.28	103.99	68.97
36	12	39.54	147.44	4.76	5.07	79.32	42.24
37[b]	14	30.09	159.92	11.39	12.23	189.82	87.38
38[b]	14	58.52	290.89	9.84	11.56	163.98	82.59
39	14	2.08	21.10	0.37	0.97	6.12	6.93
40	14	18.93	140.29	1.95	6.13	32.51	43.79
41	14	4.08	125.27	2.39	10.52	39.86	75.15
42	14	11.57	116.95	1.32	3.89	21.95	27.81

Notes:

a. Area A = near-stream sensitive areas (all RHCAs).

b. Subwatersheds marked with “b” are either above or near the TOC.

3.8.4 Environmental Consequences

The proposed action has the potential to affect water quality. In order to reduce the potential to affect water quality and beneficial uses under the Slapjack Project, a suite of Best Management Practices (BMPs) and Management and Mitigation Measures (MMMs) has been prescribed and included in the Streamside Management Plan (appendix B of the "Hydrology Report"). Implementation of these practices would reduce sediment delivery and possible water contamination related to proposed activities or existing conditions. The BMPs and MMMs are site-specific to the project area.

Appendices A and B of the "Hydrology Report" discusses the criteria for protecting streams from proposed activities in the Slapjack Project area and in the watersheds. With the implementation of BMPs, the potential for sedimentation and stream degradation of the immediate channels and the channels downstream from the project area should be minimal.

The proposed road work or stream channel restoration work would result in short-term negative effects from increased sedimentation to the streams, but beneficial effects over the long term from reduced sedimentation.

Alternative A (No Action)
- No treatments would be implemented.

Alternative B (Proposed Action)
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres), mechanical and manual methods, and prescribed burning

Alternative C
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Alternative D
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds with herbicides (up to 31 acres)

Alternative E
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds without herbicides

Alternative F
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres)

Alternative G
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

3.8.4.1 General Effects on Measure 1 — Cumulative Watershed Effects Analysis

Risks to Beneficial Uses. The application of BMPs and MMMs, including riparian buffers, would reduce the risks to beneficial uses of water from project activities. A number of subwatersheds in the analysis area are already at or approaching the TOC. Some risks to downstream beneficial uses of water could occur from this existing condition combined with future foreseeable private operations and project-related disturbances. As described below, watersheds currently approaching or above the TOC are watersheds 2, 4, 6, 13, 14, 15, 16, 17, 19, 21, 22, 24, 25, 26, 29, 37, and 38. The highest proportions of disturbance with respect to TOC occur in subwatersheds 4, 19, 22, 26, and 29, each of which exceeds 130 percent of the TOC under the existing condition. The proposed action, combined with future foreseeable private timber harvest, would substantially increase the level of disturbance in each of these watersheds, resulting in ERA scores ranging from 146 percent to 170 percent of the TOC. These subwatersheds, totaling 7,271.3 acres, would have the greatest risk of affecting downstream beneficial uses of water. Subwatershed 4 (Oroleve Creek), subwatershed 26 (Forbestown Ravine and Mosquito Gulch), and subwatershed 29

(unnamed) drain directly to the South Fork Feather River upstream of Ponderosa Reservoir. Subwatershed 19 (Dry Creek), and subwatershed 22 (Costa Creek) drain to Lake Merle Collins and the Yuba River downstream of Englebright Reservoir. In theory, all listed beneficial uses of the South Fork Feather River and the Yuba River could be at some risk from water quality degradation in these subwatersheds. In practice, the primary water quality effects would likely result from nonpoint source pollution and land clearing related to timber harvest and other land disturbances. These effects would relate to the following categories of state water quality objectives as defined in the Basin Plan:

- *Sediment* – The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
- *Turbidity* – Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. (Specific allowable increases in turbidity levels are defined as natural turbidity levels measured in nephelometric turbidity units, or NTUs.
- *Temperature* – The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses. At no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5°F above natural receiving water temperature.
- *Pesticides* – (1) No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses; (2) Discharges shall not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial use; (3) Pesticide concentrations shall not exceed those allowable by applicable antidegradation policies; (4) Pesticide concentrations shall not exceed the lowest levels technically and economically achievable; (5) Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the Maximum Contaminant Levels set forth in California Code of Regulations, Title 22, Division 4, Chapter 15.

Environmental analysis and proposed mitigations for herbicide use are described below in the section on herbicides and water quality. It is not projected that herbicide application would affect beneficial uses of water in these subwatersheds or any other portion of the analysis area.

Sediment, turbidity, and temperature could be affected if cumulative watershed effects occur in the subwatersheds with the greatest risk (as described above) or any other subwatersheds that are near or approaching the TOC. The beneficial uses at risk if this were to occur include warm and cold freshwater habitat, spawning habitat, wildlife habitat, commercial and sport fishing, and noncontact water recreation. There would likely be minimal or no risk to domestic and municipal water supplies, agricultural uses, hydropower generation, and water contact recreation, although increased sedimentation in Lake Oroville would slightly shorten the expected usable lifespan of the reservoir. The greatest risk would likely be to those uses associated with habitat. The bulk of this risk is associated with the existing condition of a highly disturbed landscape, and the future foreseeable disturbance of that landscape from private timber operations. As described below, the additional disturbance from the Slapjack Project proposed activities would contribute only a minor percentage of the total risk.

3.8.4.2 Potential Cumulative Watershed Effects

If a CWE were to occur, the most likely effect would be increased chronic sedimentation from increases in water yield and peak flow during high-intensity rain events. Peak flow changes, in particular, may cause increased sedimentation, changes in bedload transport, altered flow regimes, channel incision, undercuts and unstable banks, and channel widening (Reid 1993). If a CWE were to occur from the Slapjack Project, it would most likely occur within low-gradient, third-order or greater reaches of the channel network and/or at major confluences.

While slope instability and active landsliding have not been mapped in the analysis area, there appear to be few areas in the analysis area that are over steepened and possess inner gorge morphology. Those that do (slopes above Bullard's Bar Reservoir and the canyon of the South Fork Feather River upstream of Ponderosa Reservoir) would likely not experience measurable peak flow alteration related to proposed activities of the Slapjack Project. However, existing disturbance, combined with future foreseeable private timber harvest in subwatersheds 4, 26, and 29, may have the potential to produce CWEs in the South Fork Feather River canyon because, as described above, these watersheds are well above the TOC. There could be some landsliding in steep tributary basins, either in unchanneled colluvial hollows (ephemeral stream-swales) that have been roaded or that have had excessive runoff directed to them from ground disturbance or vegetation removal, or in steep, incised channel reaches where debris accumulation and subsequent removal by peak runoff induces streambank erosion and failure. Areas of instability noted above in the Big Hill area are likely subject to some risk of landsliding as well as channel instability. Other steep, potentially unstable areas occur in the area of Golden Gate Ravine on the west slopes of Mount Hope and in the Mosquito Gulch area north of Forbestown.

The identified CWEs from proposed activities would be mitigated during project planning, design, and implementation through

1. adoption of unit-by-unit Forest Plan standards and guidelines to protect water quality;
2. use of applicable BMPs;
3. inventory, funding, and completion of land restoration activities throughout the watershed; and
4. scheduling of future harvests to facilitate vegetative recovery.

It is assumed that protection of headwaters and tributaries to larger watersheds, along with implementation of effective nonpoint source conservation measures (BMPs), would provide protection of the entire watershed. If sedimentation is controlled through implementation of BMPs, the potential for project-related sediment delivery to the immediate channel and channels downstream would be small.

Impacts on water quality in the analysis area could potentially occur under the following circumstances:

- Failure to implement Best Management Practices, Riparian and Wetland Standards and Guidelines, and other required mitigation.

- Extreme water yields resulting from abnormally high intensity, magnitude, and duration storm events.

- Removal of vegetative matter and ground cover resulting from a wildfire.

3.8.4.3 General Effects on Measure 2 — Herbicides and Water Quality

Herbicide treatments for DFPZ maintenance would be performed by manual ground application of imazapyr (Arsenal® AC) using backpack sprayers. The formulation would also include a surfactant (Syl-Tac®) and a dye (Hi-Light® Blue). Standard HFQLG riparian buffers would be applied to all surface water bodies; no herbicide application for DFPZ maintenance would occur within the buffer areas. The HGQLG final supplemental EIS analyzed the likelihood of detection of imazapyr in surface waters with this application method, these buffers, and full implementation of all water quality BMPs. The HFQLG final supplemental EIS found that "Imazapyr is unlikely to be detected in forest streams of the Pilot Project area when streamside buffers and ground applications are used." This conclusion is based on minimal data, none of which are from the Sierra Nevada. However, since imazapyr is minimally mobile in soils and breaks down rapidly in water to nonpersistent degradates, the assumption of low likelihood of detection is probably valid.

Herbicide treatments for noxious weed control would be performed by manual ground application of triclopyr BEE (Garlon 4™) using backpack sprayers. As with imazapyr, the triclopyr BEE formulation would also include Syl-Tac® and Hi-Light® Blue, although at double the application rate as for imazapyr. The proposed rates and volumes for each chemical for each application type are listed in "Appendix C: Human Health Risk Assessment" of this EIS. The HFQLG final supplemental EIS states that, "With the establishment of adequate streamside buffers and ground application, and absent direct application onto surface waters, triclopyr concentrations in surface waters are typically not detected in forestry applications." Triclopyr is also described as variably persistent in soil, with minimal mobility and leaching. Triclopyr groundwater concentrations in forested areas are not well known, but surveys of groundwater in urban and agricultural areas did not detect triclopyr. Triclopyr degrades primarily to 3,5,6-trichloro-2-pyridinol (TCP), which may be more persistent in soil than triclopyr (Stanislaus National Forest 2004). The other chief metabolite of triclopyr BEE is butoxyethanol, which rapidly dissipates by microbial degradation (one day or less). Triclopyr BEE might be applied in close proximity to a very limited length of intermittent stream channels for alternatives B, D, and F, which propose herbicide use to control noxious weeds. Consequently, the conclusion in the HFQLG final supplemental EIS that triclopyr would not be detected in surface waters may be insufficient for analyzing these alternatives. Triclopyr does have a rapid degradation rate in water, and therefore, it is unlikely to persist in aquatic ecosystems for sufficient periods to cause harm to sensitive organisms. The HFQLG final supplemental EIS further states that there is some evidence that triclopyr can persist in floodwaters. With the very limited application of triclopyr in riparian areas proposed for the Slapjack Project, dilution under flood conditions would ensure that harmful concentrations do not occur.

If herbicides are applied as proposed for the Slapjack Project, and by employing BMPs, erosion rates would not increase from herbicide application; therefore, sediment production from treated areas would not increase, and detrimental water quality impacts from sedimentation or turbidity would not increase. Consequently, no ERA is applied in the cumulative watershed effects model for proposed herbicide application.

3.8.4.4 Alternative A

Direct Effects on Measure 1 – CWE Analysis. Under the no-action alternative, DFPZ treatments, individual tree selection, group selection, transportation improvements, wildlife restoration, and watershed restoration would not occur; hence, there would be no direct effects on the channel network from the Slapjack Project.

Vegetation density and accumulation of fuels would continue under alternative A, and the potential for stand-replacing fire and its effects on near-stream sensitive areas would remain similar or increase compared to the existing condition. While burn severity and the effects of wildfire disturbance are often limited in near-stream sensitive areas compared to upland areas, the effects of fire adjacent to channels would be devastating to the integrity of stream proper function and condition. Channel degradation, erosion, and sedimentation, and the resulting effects on stream and riparian habitats and water quality, would likely increase following a stand-replacing fire (Neary et al. 2005).

Group selection and individual tree selection treatments are designed to promote the HFQLG Act desired condition of uneven-aged (all-age), fire-resilient, multistoried stands, while maintaining a healthy forest. These treatments would provide seral stage diversity by adding patches of the youngest seral stages to portions of larger California Wildlife Habitat Relationship (CWHR) size class 4 and 5 stands. Under the no-action alternative, these stand structure improvements would not occur. In the long term, possible benefits to aquatic and riparian systems associated with the fire resiliency of these stand improvements would not occur. Possible short-term increases in runoff and erosion related to these treatments would also not occur.

Under the no-action alternative, there would be no beneficial changes in stream and meadow conditions because transportation improvements and watershed restoration would not occur. Sediment would continue to directly deposit into affected water bodies and riparian areas, and conditions would continue to degrade. Fish barriers would remain and continue to obstruct potential aquatic habitat.

Indirect and Cumulative Effects on Measure 1 – CWE Analysis. Under the no-action alternative, DFPZ treatments, group selection, individual tree selection, transportation improvements, wildlife restoration, and watershed restoration would not occur, and there would be no project-related increase in ERA values or in the risk of CWE. However, vegetation density and accumulation of fuels would persist, and the potential for stand-replacing fire and its effects on upland watershed areas and near-stream sensitive areas would remain similar or increase compared to the existing condition. As described in the Slapjack Project “Fire and Fuels Report,” the CWE analysis area is at high risk of severe wildfire that could burn the entire area. The ERA values following a stand-replacing fire would greatly exceed the TOC and greatly exceed ERA increases projected from proposed treatment activities under any of the analyzed alternatives. The consequent effects on watershed resources would be grave, and stream proper function and condition and the quantity and quality of aquatic habitat might remain compromised for decades to centuries following a severe wildfire (Neary et al. 2005).

Direct, Indirect, and Cumulative Effects on Measure 2 – Herbicides and Water Quality. Under alternative A, the proposed Slapjack Project would not be implemented, and there would be no herbicide treatments. Thus, no environmental effects associated with the application of herbicides would occur, including any that might affect water quality or be transmitted through the hydrologic system.

3.8.4.5 Alternative B

Direct Effects on Measure 1 – CWE Analysis. Under the proposed action, there is potential for direct effects on hydrologic function from prescribed vegetation management activities, transportation improvements, wildlife restoration, and watershed restoration. It is assumed that protection of headwaters and tributaries to larger watersheds, along with implementation of effective nonpoint source conservation measures (the BMPs), would provide protection of the entire watershed. If sedimentation is controlled through implementation of BMPs, potential of sedimentation to the immediate channel and channels downstream should be small.

In the DFPZ treatment units, RHCAs in plantations and brush fields would be treated to improve riparian habitat conditions (see appendix A of the "Hydrology Report"). In RHCAs, no-tractor equipment zones would be marked on the ground, based upon SMZ guidelines contained in the 1988 *Plumas National Forest Land and Resource Management Plan* (the "Forest Plan") and field surveys. In harvest units, equipment may reach into RHCAs in the no-tractor equipment zone. Trees in streambank areas would be retained to ensure continued bank stability. SMZ designations for ephemeral swales would be marked on the ground; these are also considered no-tractor equipment zones. In harvest units, treatments may still occur in these zones by equipment "reaching in." Trees along streambanks would not be removed. In underburn units, fires would not be ignited in RHCAs but may be allowed to creep into them. The approximate acres of treatments include 101 of under burning, 97 of harvesting, 31 of mastication, and 69 of wildlife habitat improvement.

No direct effects from group selection and individual tree selection treatments would occur because treatment units would not overlap RHCAs and SMZs.

There is potential for direct effects on hydrologic function from transportation system improvements and watershed restoration activities, especially from in- or near-stream activities like culvert improvement, streambank stabilization, meadow restoration, and fish barrier removal. Decommissioning of roads in RHCAs has the potential to cause short-term direct effects, but there would be long-term improvements to stream and meadow conditions. A net reduction in direct effects would occur after the completion of restoration activities.

Indirect Effects on Measure 1 – CWE Analysis. Under the proposed action, there would be the potential for indirect effects on hydrologic function from prescribed vegetation management activities. It is assumed that protection of headwaters and tributaries to larger watersheds, along with implementation of effective nonpoint source conservation measures (the BMPs), would provide protection of the entire watershed. If sedimentation is controlled through implementation of BMPs, potential of sedimentation to the immediate channel and channels downstream should be small.

The risk of indirect watershed effects on streams from proposed DFPZ treatments would be low. The total ERA value resulting from the proposed DFPZ treatments would be 9 percent of the analysis area total ERA for the CWE analysis area, including the proposed action and future foreseeable activities.

The proposed group selection and individual tree selection units would mostly situated in upland positions away from channels, and full RHCA protection would apply. Therefore, even though intensive mechanical treatment would occur during group selection and individual tree selection

harvests, the distribution of this activity with respect to channels and RHCAs would be sparse, and consequently, the risk of indirect watershed effects on streams would be low. The total ERA value resulting from the proposed group selection and individual tree selection treatments would be less than 2 percent of the total ERA for the CWE analysis area, including the proposed action and future foreseeable activities.

There is potential for indirect effects on hydrologic function from transportation system improvements (especially from reconstruction and decommissioning), wildlife habitat restoration, and watershed restoration activities. These improvements, however, would benefit the hydrologic function and condition of the subwatersheds. There would be a net reduction in sediment being mobilized and reaching the stream through road drainage improvement, BMP implementation and restoration of the habitat connectivity of stream systems. Also, through proposed road decommissioning, a net reduction in the ERA of 66.8 acres would be achieved. Of this, 12.9 acres are located in near-stream sensitive areas, where decommissioning would likely achieve the greatest reduction in indirect effects. The total ERA increase from proposed wildlife habitat restoration would be 0.1 percent of the analysis area, which would not have measurable detrimental effects on watershed condition.

Cumulative Effects on Measure 1 – CWE Analysis. The results of the cumulative watershed effects model for the proposed action include the sum of all ERA values for the existing condition, reasonable foreseeable future activities, and the proposed action. A summary of the CWE model outputs for the proposed action is presented in table 3-34.

Table 3-34. Alternative B ERA compared to the TOC, by subwatershed.

Subwatershed Label	Percent Disturbed		Percent of TOC	
	Area A[a]	Total	Area A[a]	Total
1	6.92	9.91	115.26	76.22
2[b]	9.12	11.55	151.94	96.24
4[b]	16.40	18.54	273.33	154.52
5	2.11	7.41	35.09	52.90
6[b]	10.10	12.98	168.30	92.69
7	5.43	9.83	90.42	70.19
8	7.96	11.08	132.75	79.15
9	3.47	5.79	57.88	48.27
10	0.09	2.23	1.43	15.91
11	5.10	6.32	85.01	45.15
12	5.75	8.80	95.81	62.88
13[b]	10.90	13.24	181.73	94.56
14[b]	14.54	13.05	242.38	93.22
15[b]	10.50	17.44	174.99	124.60
16[b]	20.74	14.89	345.61	106.37
17[b]	17.05	13.66	284.23	97.54
18	4.93	7.89	82.22	56.39
19[b]	22.49	22.28	374.85	159.16
21[b]	18.95	20.05	315.91	143.21
22[b]	25.82	23.10	430.35	164.98
23	6.06	10.47	100.97	74.79
24[b]	14.22	14.96	236.95	106.88

Table 3-34. Alternative B ERA compared to the TOC, by subwatershed (continued).

Subwatershed Label	Percent Disturbed		Percent of TOC	
	Area A[a]	Total	Area A[a]	Total
25[b]	14.63	14.76	243.89	105.43
26[b]	10.09	17.57	168.22	146.45
27	3.21	5.02	53.43	41.82
28	2.44	1.94	40.71	16.16
29[b]	41.15	20.45	685.87	170.41
30	2.23	5.09	37.21	42.40
31	2.02	6.50	33.67	54.13
32	3.49	8.60	58.11	71.68
33	3.78	7.78	63.08	64.83
34	2.19	4.90	36.46	40.82
35	7.25	8.84	120.86	73.65
36	5.59	6.35	93.15	52.91
37[b]	11.91	13.74	198.52	98.11
38[b]	9.84	11.84	163.98	84.60
39	0.37	2.68	6.12	19.14
40	1.96	6.73	32.70	48.05
41	2.39	10.90	39.86	77.85
42	1.32	3.93	21.95	28.06

Notes:

a. Area A = near-stream sensitive areas (all RHCAs).

b. Subwatersheds marked with “b” are either above or near the TOC.

All 26 subwatershed near-stream sensitive areas that approach or exceed the TOC under the existing condition would remain near or above the TOC with the proposed action. Some subwatershed near-stream sensitive areas would experience a slight increase in ERA from proposed DFPZ treatments or a slight decrease from proposed road decommissioning.

There are 7 subwatersheds approaching, and 12 subwatersheds exceeding the TOC. Subwatershed 24 approaches the TOC under the existing condition, and would exceed the TOC under alternative B. Subwatershed 23 would decrease in the percent of TOC due to the proposed road decommissioning activities.

In the subwatersheds that exceed the TOC, private land harvest activities are the major contributor to the high ERA scores, followed by roads and urban development. For all subwatersheds, the past 25 years of harvest activities on the Plumas National Forest, plus the proposed Slapjack Project activities, may contribute anywhere from 1 to 71 percent of the total ERA score. In the subwatersheds that approach or exceed the TOC, 25 years of past activities on the Plumas National Forest, combined with the proposed Slapjack Project activities, may contribute between 1 and 16 percent of the total ERA. Of the subwatersheds that exceed the TOC by the greatest proportion (subwatershed 4 at 155 percent of TOC; 15 at 125 percent of TOC; 19 at 159 percent of TOC; 21 at 143 percent of TOC; 22 at 165 percent of TOC; 26 at 146 percent of TOC; and 29 at 170 percent of TOC), the past and present activities on the Plumas National Forest would contribute in excess of 10 percent of the total ERA in only three of the subwatersheds. The greatest contribution under the

proposed action would be in subwatershed 21, where 20 percent of the total ERA would arise from past activities on the Plumas National Forest and from proposed Slapjack Project activities.

Stream condition surveys were conducted on stream reaches located within the DFPZ treatment units. Stream and riparian conditions in the analysis area have been disturbed by past logging activities, mining, and roads. It is assumed that protection of headwaters and tributaries to larger watersheds, along with implementation of effective nonpoint source conservation measures (BMPs), would provide protection of the entire watershed and reduce the risk of CWEs from the proposed activities under alternative B.

As stated in the “Fire and Fuels” section (3.5) in this EIS, the DFPZ treatments would be effective if a wildland fire at or below the 90th percentile weather conditions were to occur. An effective DFPZ may not entirely eliminate the possibility of high-severity wildfire affecting some watersheds, particularly where there is heavy fuel loading on steep canyon slopes. The DFPZ would, however, provide firefighters an opportunity to contain the fire to one or two watersheds and prevent it from spreading across larger portions of the landscape. Proposed future projects would similarly treat other portions of the landscape, and over time, the aggregate risk of stand-replacing fires would be reduced. The potential risk of CWEs from stand-replacing wildfire in the long term would greatly exceed the short-term increased risk of CWEs related to the proposed DFPZ treatments under the Slapjack Project.

Group selection and individual tree selection treatments are designed to promote the HFQLG Act desired condition of uneven-aged, multistoried, fire-resilient stands, while maintaining a healthy forest. These treatments would provide seral stage diversity by adding patches of the youngest seral stages to portions of larger CWHR size class 4 and 5 stands. Under this alternative B, these stand structure improvements would occur, and in the long term, possible benefits to aquatic and riparian systems associated with the fire resiliency of these stand improvements would also occur. Possible short-term increases in runoff and erosion related to these treatments could also occur.

Improvements to the transportation system, streambank stabilization projects, fish barrier removal, and meadow enhancement projects would have long-term benefits for the subwatersheds, especially in the near-stream sensitive areas. Benefits would include reduction in road- and bank-related erosion, drainage diversion and sediment deposition to channels; improved function and condition of channels and improved aquatic and riparian habitat, and increased availability of aquatic habitat to mobile species of fish, amphibians, and invertebrates from restoration of habitat connectivity. Short-term sediment increases that may result from these restoration activities would be offset by the ecological benefits and enhanced beneficial uses that are the intent of these restoration activities.

The proposed road decommissioning and closure under alternative B would reduce road mileage and road density (see figure A-3 in appendix A of this EIS for maps of the proposed road changes and tables 3-37 and 3-38 in the “Transportation System” section (3.11) of this EIS). The post-project road densities of near-stream sensitive areas would range from 0.1 mile to 7.5 miles per square mile, with an average of 4.2 miles per square mile. The post-project road densities of the subwatersheds would range from 1 mile to 8.3 miles per square mile, with an average of 5.5 miles per square mile.

Direct Effects on Measure 2 – Herbicides and Water Quality. Under alternative B, herbicides would be used to maintain the effectiveness of DFPZs and to control noxious weeds. The proposed quantities and application rates of the herbicides are listed below in tables 3-28 and 3-29 of the "Human Health and Safety" section (3.7).

Herbicide use for DFPZ maintenance is proposed on 1,954 acres in the Slapjack Project area, with a single application two to three years after DFPZ construction. Herbicides would be used to control noxious weeds on a maximum of 31 acres in the project area, with up to five successive annual applications to ensure successful eradication. Up to 5 acres of overlap might occur between DFPZ and weed control applications. No herbicides are proposed for use in conjunction with proposed transportation system improvements or with aquatic and wildlife habitat restoration. The HFQLG Act standard riparian buffers would be employed for the DFPZ treatments, and no herbicides would be used within the buffered areas. Herbicides would not be used in the 500-foot buffers where Threatened, Endangered, or Sensitive amphibian species occur. There is a red-legged frog (*Rana aurora draytonii*) population in the southern portion of the project area.

For weed control, 50-foot buffers would be applied to perennial streams. No-spray buffers would be applied to intermittent streams, and a Limited Operating Period would be imposed to restrict spraying to the driest portion of the year, when these streams are not flowing. Spraying would not occur if precipitation is forecasted. These and other restrictions on herbicide application are listed in appendix F of this EIS.

Over 500 feet of a 550-foot perennial channel are proposed for herbicide application. This 500-foot single segment is located in a headwater portion of a tributary to Sucker Run (SE 1/4 of NW 1/4, Section 26, R6E T20N), where there is an approximately 8-acre stand of French broom (*Genista monspessulana*). Approximately 2.9 acres of RHCA would be treated with triclopyr BEE in this stand. Herbicides would be used to treat French broom in other riparian areas, which are roadside occurrences north of Challenge in Section 19, T19N R7E (approximately 0.2 acre of RHCA would be treated in this area). All proposed riparian spray areas would be a minimum of 0.25 mile upstream of perennial streams. The BMPs are designed to maximally reduce or eliminate the possibility of detection of herbicides in aquatic ecosystems. To ensure these BMPs are met, monitoring plans for the presence and concentration of herbicides in soil, surface water, and groundwater would be applied. The monitoring plans would include baseline monitoring prior to the first herbicide applications to establish baseline conditions and to assess the risk of cumulative effects.

As described above in "General Effects" (section 3.8.4.1), there would be no significant adverse environmental effects from proposed herbicide use under alternative B. Direct effects of herbicide use for DFPZ maintenance would be prevented by employing BMPs and the HFQLG Act standard riparian buffers, which should adequately protect all known beneficial uses of water, thus water quality objectives would be achieved. No direct effects would occur where herbicides are applied in RHCAs for weed control because Limited Operating Periods would restrict application to the driest portion of the year when intermittent channels are dry.

Indirect Effects on Measure 2 – Herbicides and Water Quality. Indirect effects of herbicide use for DFPZ maintenance under alternative B would be prevented by applying BMPs and HFQLG Act standard riparian buffers. Riparian buffers and BMPs would adequately protect all known beneficial uses of water, and water quality objectives would be achieved. No indirect effects would occur where

herbicides are applied in RHCAs for weed control because Limited Operating Periods would restrict application to the driest portion of the year when intermittent channels are dry. Also, the rapid degradation of triclopyr in water and the distance from perennial channels would protect downstream aquatic ecosystems and organisms from adverse effects.

Cumulative Effects on Measure 2 – Herbicides and Water Quality. Cumulative effects of herbicide use for DFPZ maintenance or noxious weed control under alternative B would not occur because (1) no herbicides have been applied in the project area (except in the Challenge Experimental Forest) since 1983; (2) a single application is proposed for DFPZ maintenance, so no additive effects would occur as a result of the proposed action; and (3) riparian buffers and BMPs would prevent detectable amounts of herbicides from entering the stream system. Although some detectable residue from herbicide use on adjacent private lands or on the Challenge Experimental Forest may be present, the proposed project-related activities would not increase the detected amounts. There would be a minor (up to 5 acres) overlap between areas proposed for herbicide use to maintain DFPZs and areas to control noxious weeds. Cumulative effects from these concurrent uses would be prevented due to these small areas of overlap, the creation of riparian buffers for all DFPZ applications and any weed control applications near perennial streams, and the strict adherence to BMPs. Although successive applications of triclopyr BEE may occur for noxious weed control for up to five years, rapid degradation of triclopyr in water and the distance from perennial channels would prevent persistence of triclopyr in downstream aquatic ecosystems and any cumulative effects.

3.8.4.6 Alternative C

Direct, Indirect, and Cumulative Effects on Measure 1 – CWE Analysis. There would be no differences in mechanical treatments for DFPZ implementation, group selection, individual tree selection, transportation system improvements, and aquatic and wildlife habitat restoration between this alternative and alternative B. DFPZ maintenance would not occur for approximately 10 years; therefore, any increase in ERAs from mechanical DFPZ maintenance cannot be analyzed at this time. The net acreage of mechanical treatment for noxious weed control would be minimal, and no detectable increase in direct, indirect, or cumulative effects on watershed or stream conditions from mechanical versus chemical noxious weed control is anticipated.

Direct, Indirect, and Cumulative Effects on Measure 2 – Herbicides and Water Quality. Under alternative C, herbicides would be not be used to maintain the effectiveness of DFPZs, and herbicides would be not be used to control noxious weeds. Therefore, no direct, indirect, or cumulative environmental effects from herbicides would be possible under this alternative.

3.8.4.7 Alternative D

Direct, Indirect, and Cumulative Effects on Measure 1 – CWE Analysis. There would be no differences in mechanical treatments for DFPZ implementation, group selection, individual tree selection, transportation system improvements, and aquatic and wildlife habitat restoration between this alternative and alternative B (see section 3.8.6.4). DFPZ maintenance would not occur for approximately 10 years; therefore any increase in the ERAs from mechanical DFPZ maintenance cannot be analyzed at this time.

Direct and Indirect Effects on Measure 2 – Herbicides and Water Quality. Alternative D does not propose the use of herbicides to maintain the effectiveness of DFPZs, but it does propose herbicide use to control noxious weeds. Alternative D, as with alternative B, would not result in significant adverse environmental effects from proposed herbicide use. There would be no direct effects where herbicides are applied in RHCAs for weed control because Limited Operating Periods would restrict application to the driest portion of the year when intermittent channels are dry. Also, the rapid degradation of triclopyr in water and the distance from perennial channels would protect downstream aquatic ecosystems and organisms from adverse effects.

Cumulative Effects on Measure 2 – Herbicides and Water Quality. There would be no cumulative effects of herbicide use to control noxious weeds because no herbicides have been applied in the project area (except in the Challenge Experimental Forest) since 1983, and riparian buffers and BMPs would prevent detectable amounts of herbicides from entering the stream system. Although some detectable residue from herbicide use on adjacent private lands or on the Challenge Experimental Forest may be present, the proposed activities under the Slapjack Project would not increase the detected amounts. Successive applications of triclopyr BEE may occur for noxious weed control for up to five years, but rapid degradation of triclopyr in water, and the distance from perennial channels, would prevent persistence of triclopyr in downstream aquatic ecosystems and any cumulative effects.

3.8.4.8 Alternative E

Direct, Indirect, and Cumulative Effects on Measure 1 – CWE Analysis. There would be no differences in mechanical treatments for DFPZ implementation, group selection, individual tree selection, transportation system improvements, and aquatic and wildlife habitat restoration between this alternative and alternative B. The net acreage of mechanical treatment for noxious weed control would be minimal, and no detectable increases in direct, indirect, or cumulative effects on stream or watershed conditions from mechanical versus chemical noxious weed control are anticipated.

Direct and Indirect Effects on Measure 2 – Herbicides and Water Quality. Under alternative E, herbicides would be used to maintain the effectiveness of the DFPZ, but herbicides would be not be used to control noxious weeds. As with alternative B, direct and indirect effects of herbicide use for DFPZ maintenance would be prevented by applying BMPs and the standard HFQLG Act riparian buffers, which would adequately protect all known beneficial uses of water, thus water quality objectives would be achieved.

Cumulative Effects on Measure 2 – Herbicides and Water Quality. Cumulative effects of herbicide use for DFPZ maintenance would not occur because (1) no herbicides have been applied in the project area (except in the Challenge Experimental Forest) since 1983; (2) a single application is proposed for DFPZ maintenance, so no additive effects would occur as a result of the proposed action; and (3) riparian buffers and BMPs would prevent detectable amounts of herbicides from entering the stream system. Although some detectable residue from herbicide use on adjacent private lands or on the Challenge Experimental Forest may be present, the proposed activities under the Slapjack Project would not increase the detected amounts.

3.8.4.9 Alternative F

Direct Effects on Measure 1 – CWE Analysis. There would be no difference in mechanical treatments for DFPZ implementation, transportation system improvements, and aquatic and wildlife habitat restoration between this alternative and alternative B. Any increase in direct effects from mechanical DFPZ maintenance cannot be analyzed at this time because DFPZ maintenance would not occur for approximately 10 years after DFPZ construction. The application of BMPs and other mitigation measures would minimize or eliminate the chance of direct effects on watershed resources and beneficial uses. The reduction in acreage of group selection treatments would further reduce the already minimal risk of direct effects on watershed conditions from group selection.

Indirect Effects on Measure 1 – CWE Analysis. Indirect effects would be similar to those described in alternative B. This alternative would only affect subwatersheds 21, 22, 24, 26, and 29. A total of 19 group selection units are dropped: one group selection unit is located in subwatershed 21, one is in subwatershed 22, eleven are in subwatershed 24, six are in subwatershed 26, and one is in subwatershed 29.

The reduction in the number of groups decreases the risk of indirect effects from the proposed group selection treatments. The proposed group selection units are mostly situated in upland areas away from stream channels, and although group selection would involve intensive mechanical treatment, the distribution of the treatments with respect to stream channels and RHCAs would be sparse, and consequently the risk of indirect watershed effects on streams would be low.

Cumulative Effects on Measure 1 – CWE Analysis. The CWE model results for alternative F include the sum of ERA values for the existing condition, reasonable foreseeable future activities, and for the proposed action (alternative B). A summary of the CWE model outputs for alternative F appears in table 3-35. Only the subwatersheds with changes in ERA scores from alternative are included in the following table and discussion.

There would be no change in the ERA scores for near-stream sensitive areas under alternative F compared to alternative B. Group selection units would be located outside of RHCAs; therefore, the reduction in acres of group selection would have no impact on the ERA scores for these areas.

Table 3-35. Alternative F proposed action ERA compared to TOC by subwatershed.

Subwatershed Label	Percent Disturbed		Percent of TOC	
	Area A[a]	Total	Area A[a]	Total
21[b]	18.95	20.05	315.91	143.21
22[b]	25.82	23.10	430.35	164.98
24[c]	14.22	14.96	236.95	106.88
26[b]	10.09	17.57	168.22	146.45
29[b]	41.15	20.45	685.87	170.41

Notes:
a. Area A = near-stream sensitive areas (all RHCAs).
b. This subwatershed would have a change in ERA scores from alternative B; it is over the TOC.
c. This subwatershed would have a change in ERA scores from alternative B; it is near the TOC.

There would be less than a 1 percent reduction in percent of TOC scores in subwatersheds 21, 22, 24, 26, and 29 under alternative F compared to alternative B. The reduction in group acres is too small of a difference to influence the elevated percent of TOC scores. The high TOC scores are due to harvest activities on private land, roads, and urban development. The reduction in the number of groups would decrease the risk of cumulative effects, but the long-term benefits of group selection would not occur. In the long term, possible benefits to aquatic and riparian systems associated with the fire resiliency of these stand improvements would not occur. Possible short-term increases in runoff and erosion related to these treatments would also not occur.

Direct, Indirect, and Cumulative Effects on Measure 2 – Herbicides and Water Quality. The effects would be the same as those described for alternative B.

3.8.4.10 Alternative G

Direct, Indirect, and Cumulative Effects on Measure 1 – CWE Analysis. There would no difference in this alternative compared to alternative F.

Direct, Indirect, and Cumulative Effects on Measure 2 – Herbicides and Water Quality. Under alternative G, herbicides would be not used to maintain DFPZs, nor would they be used for noxious weed control; thus environmental effects from herbicide use would not be possible under this alternative.

3.8.5 Past, Present, and Reasonably Foreseeable Future Actions

In the cumulative watershed effects analysis area, known land-disturbing activities where a proposed action has been defined were included in the final cumulative effects assessment. In this analysis area, there are currently no activities with a proposed action on the Plumas National Forest; however, the DFPZ treatments for the Slapjack Project are connected to other DFPZ projects currently being implemented. There are several timber harvest plans on private lands. A list of past, present, and reasonably foreseeable future projects in the CWE analysis area is included in appendices F and G of the “Hydrology Report.” Subwatersheds 5, 7, 8, 21, 22, 26, 27, 29, 30, 32, 33, 35, 36, and 37 have proposed future private land activities.

3.8.6 Summary of Cumulative Effects

Measure 1: CWE Analysis. A comparison of ERA scores in relation to the TOC for each alternative is included in table 3-36. The differences between alternatives A and B are from proposed and future activities on private land. In the subwatersheds that exceed the TOC, the majority of the ERAs are from private land timber harvesting, urban development, and roads. These three disturbance types constitute from 80 to 90 percent of the total ERA scores. Under the existing condition, the past 25 years of Plumas National Forest activities constitute from 0 to 9 percent of the total ERA score. For alternatives B, C, D, and E, the past 25 years plus the proposed project would account for 2 to 21 percent of the total ERA score. There would be less than a one percent difference in percent of TOC between alternatives B, F, and G in subwatersheds 21, 22, 24, 26, and 29. The reduction in group acres is too small of a difference to influence the elevated percent of TOC scores.

Table 3-36. Comparison of percent of TOC for each alternative.

Subwatershed Label	Alternative A (No Action)		Alternative B (Proposed Action)		Alternatives C, D, E		Alternatives G and F	
	Area A[a]	Total	Area A[a]	Total	Area A[a]	Total	Area A[a]	Total
1	115.26	75.33	115.26	76.22	115.26	76.22	115.26	76.22
2	153.86	91.22	151.94	96.24	151.94	96.24	151.94	96.24
4	263.74	141.05	273.33	154.52	273.33	154.52	273.33	154.52
5[c]	44.05	29.23	35.09	52.90	35.09	52.90	35.09	52.90
6[d]	168.30	89.84	168.30	92.69	168.30	92.69	168.30	92.69
7	93.43	48.58	90.42	70.19	90.42	70.19	90.42	70.19
8	132.84	74.98	132.75	79.15	132.75	79.15	132.75	79.15
9	52.82	44.08	57.88	48.27	57.88	48.27	57.88	48.27
10[b]	2.89	9.14	1.43	15.91	1.43	15.91	1.43	15.91
11[c]	94.37	39.14	85.01	45.15	85.01	45.15	85.01	45.15
12	105.02	50.20	95.81	62.88	95.81	62.88	95.81	62.88
13	187.91	87.23	181.73	94.56	181.73	94.56	181.73	94.56
14	242.38	92.94	242.38	93.22	242.38	93.22	242.38	93.22
15	172.99	110.94	174.99	124.60	174.99	124.60	174.99	124.60
16	345.24	103.81	345.61	106.37	345.61	106.37	345.61	106.37
17	239.44	86.44	284.23	97.54	284.23	97.54	284.23	97.54
18	60.37	29.52	82.22	56.39	82.22	56.39	82.22	56.39
19	365.21	148.96	374.85	159.16	374.85	159.16	374.85	159.16
21	317.51	121.26	315.91	143.21	315.91	143.21	315.91	143.29
22	404.45	145.96	430.35	164.98	430.35	164.98	430.35	164.91
23[d]	102.44	76.17	100.97	74.79	100.97	74.79	100.97	74.79
24	233.30	91.68	236.95	106.88	236.95	106.88	236.95	105.60
25	243.89	104.49	243.89	105.43	243.89	105.43	243.89	105.43
26	168.22	130.04	168.22	146.45	168.22	146.45	168.22	145.10
27	53.17	35.70	53.43	41.82	53.43	41.82	53.43	41.82
28	38.61	14.98	40.71	16.16	40.71	16.16	40.71	16.16
29[d]	678.53	157.11	685.87	170.41	685.87	170.41	685.87	170.09
30[b]	34.85	36.85	37.21	42.40	37.21	42.40	37.21	42.40
31	33.67	53.99	33.67	54.13	33.67	54.13	33.67	54.13
32	61.02	73.02	58.11	71.68	58.11	71.68	58.11	71.68
33[b]	62.84	32.18	63.08	64.83	63.08	64.83	63.08	64.83
34[b]	36.46	39.83	36.46	40.82	36.46	40.82	36.46	40.82
35	103.99	68.97	120.86	73.65	120.86	73.65	120.86	73.65
36[d]	79.32	42.24	93.15	52.91	93.15	52.91	93.15	52.91
37	189.82	87.38	198.52	98.11	198.52	98.11	198.52	98.11
38[d]	163.98	82.59	163.98	84.60	163.98	84.60	163.98	84.60
39[c]	6.12	6.93	6.12	19.14	6.12	19.14	6.12	19.14
40	32.51	43.79	32.70	48.05	32.70	48.05	32.70	48.05
41	39.86	75.15	39.86	77.85	39.86	77.85	39.86	77.85
42	21.95	27.81	21.95	28.06	21.95	28.06	21.95	28.06

Notes: a. Area A = near-stream sensitive areas (all RHCAs).
b. Hardhead minnow present.
c. Hardhead minnow suspected.
d. Approaching the TOC, and hardhead minnow present or suspected

It is assumed that protection of headwaters and tributaries to larger watersheds, along with implementation of effective nonpoint source conservation measures (BMPs), would provide protection of the entire watershed and reduce the risk of CWEs from the proposed actives.

Measure 2 – Herbicides and Water Quality. Erosion rates would not increase from herbicide application due to application of BMPs; thus, sediment production from treated areas would not increase, and detrimental water quality impacts from sedimentation or turbidity would not increase if herbicides are applied as proposed for the Slapjack Project. Consequently, no ERA is applied in the CWE model for proposed herbicide application. Proposed herbicides are considered to have minimal toxicity to humans and other organisms beyond the target species of plants and other sensitive species of plants.

3.9 Recreation, Visuals, Lands, and Minerals

3.9.1 Introduction

Recreation and land and mineral operations have historically been important activities in the vicinity of Bullard's Bar Reservoir and the communities of Challenge, Forbestown, Clipper Mills, and Feather Falls, California. The early trails and wagon roads (including those from the gold rush period of the 1850s) throughout the area still serve as important access routes for people in the nearby mountain and river communities to hunt, fish, mine, access land, and camp on the Plumas National Forest.

Most of the recreational use consists of dispersed activities such as hunting, picnicking, camping, fishing, wood cutting, hiking, backpacking, horseback riding, driving for pleasure, off-highway vehicle (OHV) use, and observing nature. Other recreational activities include, but are not limited to photography, mushrooming, and collection of basket-weaving materials. Madrone Cove Campground (accessible only by boat) is the one developed campground on the Plumas National Forest. The campground is on Bullard's Bar Reservoir and administered by the Tahoe National Forest.

The 1988 *Plumas National Forest Land and Resource Management Plan* (often referred to as the "Forest Plan") projected increases, over the next 50 years in recreation demand for all Recreation Opportunity Spectrum (ROS) classes. The ROS classes have been assessed for the Slapjack Project area and are defined in the Forest Plan. Approximately 50 percent of the project area is in a Roaded Modified Setting, where the sights and sounds of people are moderate, and roads, landings, and debris are evident. Approximately 25 percent of the project area (predominantly along the Oregon Hill Road, South Fork Feather River, and the area near Pike County Lookout) is in a Roaded Natural Setting, where sights and sounds of people are moderate. The area is mostly naturally appearing as viewed from sensitive roads and trails, and access travel is conventional motorized. The remaining 25 percent is designated as a Rural Setting and encompasses areas near Forbestown, Woodleaf, Clipper Mills, and Oregon Peak. Sights and sounds of people are evident, and the natural environment is culturally modified, yet attractive. Access and travel facilities are for individual intensive motorized use.

It should be noted that OHV use is increasing significantly, and this use is not being limited to roads and trails. OHV use in areas where access can be obtained (open ridges, firelines, and open country) is increasing rapidly. The Plumas National Forest is currently undergoing an OHV route inventory and designation process that will eventually restrict OHV use to specific routes and areas. No roads proposed for decommissioning or closure in the project area would be decommissioned or closed until the OHV route inventory and designation process is complete, which is scheduled for no later than 2008, unless egregious resource damage is occurring.

There are several Special Use Authorizations for nonfederal land uses in the vicinity of the project area. These authorizations are for road access into private property, stream gauge and monitoring equipment, a water tank and associated water line, telephone lines, and power lines.

Currently, there are no known Notices of Intent in the project area or Plans of Operation on file for mineral operations within the last five years.

3.9.1.1 Regulatory Framework

The 1988 Forest Plan (*Plumas National Forest Land and Resource Management Plan*) established goals, policies, and objectives for the management of the Forest (pages 4-3 to 4-11 and 4-13 to 4-20). The following list presents the specific Forest Plan goals that apply to recreation, lands, and minerals in the Slapjack Project area:

- Provide for a variety of forest-related recreation, and coordinate recreation with other resource use through the Recreation Opportunity Spectrum system.
- Improve and expand developed facilities and trails to meet demand while reducing unit costs and protecting other resources.
- Minimize conflicts between various recreational users.
- Allow use of off-highway vehicles wherever user conflicts or unacceptable resource damage are unlikely.
- Maintain high visual quality on lands committed to other uses or readily apparent from recreation developments, major travel routes, and other high use areas.
- Authorize nonfederal use of Plumas National Forest lands only if compatible with Management Area direction, use of other land is not feasible, conditions of issuance will mitigate all significant environmental impacts, and the public interest is protected.
- Encourage mineral and materials development throughout the Forest, except in specified areas withdrawn to protect sensitive resources or substantial investments that cannot otherwise be protected.

A key goal of the Recreation Opportunity Spectrum is to provide high-quality scenery (especially scenery with naturally appearing landscapes), which enhances people's lives and benefits society. The Visual Management System was developed to provide a process for the management of the "seen" aspects of the land and also the activities that occur on it. The process involves inventory, analysis, and the determination of Visual Management Objectives and provides for their input into an integrated resources planning and decision-making process. The synthesis of this information is used to determine Visual Quality Objectives for managing forest lands; the objectives describe different degrees of acceptable alteration of the natural landscape.

3.9.2 Methodology for Assessing Impacts on Recreation, Visuals, Lands, and Minerals

3.9.2.1 Scope of the Analysis

The analysis area for recreation, lands, and minerals that may be directly, indirectly, and cumulatively affected is the Slapjack Project area. Vegetation and transportation management proposals in the project area could affect recreational, land, and mineral opportunities and use, as well as the visual quality in the area. The proposed actions would have little effect on recreation, lands, and minerals outside the project area.

The indicators analyzed in detail for recreation include the Recreation Opportunity Spectrum and Visual Quality Objectives. Indicators analyzed in detail for lands and minerals include numbers of Special Use Authorizations, Notices of Intent, and Plans of Operation that were issued within the last five years or may be proposed in the foreseeable future.

3.9.2.2 Analysis Methods

The Visual Management System presents a vocabulary for managing scenery and a systematic approach for determining the relative value and importance of scenery and associated recreation in a National Forest. High-quality scenery, especially scenery with naturally appearing landscapes, enhances people's lives and benefits society. Ecosystems provide the environmental context for this scenery management system. The system is used in the context of ecosystem management to inventory and analyze scenery in a National Forest, to assist in the establishment of overall resource goals and objectives, to monitor the scenic resource, and to ensure high-quality scenery for future generations.

The Recreation Opportunity Spectrum (ROS) classes (as described in the Forest Plan), including Visual Management System and Visual Quality Objectives for the Slapjack Project area, were evaluated for changes that would result from project implementation.

Reviews of special uses and minerals files and databases were used to determine the extent of any current or foreseeable future land or mineral use in the project area and were evaluated for changes or potential changes that would result from project implementation.

3.9.3 Affected Environment (Existing Conditions)

The Slapjack Project area is located in the front country, which is predominantly intermixed with the Wildland Urban Interface towns of Forbestown, Challenge, Feather Falls, and Clipper Mills, and the recreational influence zone near Bullard's Bar Reservoir. Ground-based logging systems would be used to construct DFPZs and to conduct timber harvest in group selection units.

The 1988 Forest Plan characterized the ecological and social conditions in the Slapjack Project area and provided a context for future forest management decisions in the area.

3.9.3.1 Motorized Recreation

Motorized recreation is an important use of the Plumas National Forest, and OHV use has increased dramatically over the last decade, both locally and nationally. This use is expected to increase in the future. Trails and roads in the affected watersheds generally meet current recreation needs, although an OHV route inventory and designation process is in progress to identify routes and areas to be established by Forest Order. All other areas would be restricted from OHV use.

3.9.3.2 Recreation Opportunity Spectrum

Maintaining and improving current dispersed camping, hunting, fishing, and other recreational opportunities is a moderate priority. The Recreation Opportunity Spectrum (1986 ROS Book)

describes the recreation setting and opportunities and is used to evaluate recreation potential in the area. The Plumas National Forest ROS inventory is described in appendix R of the 1988 Forest Plan. The Plumas National Forest has been inventoried and divided into five classes: Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized, Roaded Natural, and Rural.

The Roaded Natural class, as described in the ROS User's Guide, has been divided into two subclasses: Roaded Natural and Roaded Modified. Approximately 50 percent of the project area is Roaded Modified, 25 percent is Roaded Natural, and the other 25 percent is Rural. These classes are defined as follows:

- Roaded Modified is defined as those Roaded Natural areas that are also coded as Middleground, Background, or Unseen and Sensitivity Level II or III. This is the general resource management area of the forest, typified by pickup trucks and many miles of dirt and gravel roads. Other than trails and trailheads, virtually no improvements are present. Users experience low interaction.

- Roaded Natural is defined as those original Roaded Natural areas that are also coded as Foreground and Sensitivity Level I. These lands lie along the major travel ways and viewsheds, and nearly all developed sites are in this class. Paved roads and hardened sites are common. User interaction is moderate to high at developed sites.

- Rural is a substantially modified natural environment. Sights and sounds of people are evident. Renewable resource modification and utilization practices enhance specific recreation activities or provide the protection of vegetative soil cover.

3.9.3.3 Visual Quality Objectives

Visual Quality Objectives (VQOs) were mapped as part of the forest planning process using Agriculture Handbook 462 – Visual Management System, volume 2, chapter 1 (1974). The VQOs describe different degrees of acceptable alteration of the natural and characteristic landscape. The objectives are considered the measurable standards for the management of the "seen" aspects of the land. The following VQO definitions apply to the landscape in the project area:

- **Retention** – activities are not to be evident to the casual forest visitor.

- **Partial Retention** – activities may be evident but must remain subordinate to the characteristic landscape.

- **Modification** – activities may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. Activities should appear as a natural occurrence when viewed in the Foreground or Middleground.

Approximately 50 percent of the project area has a VQO of Modification, while the remaining approximately 50 percent is almost equally divided between Retention and Partial Retention.

3.9.3.4 Special Use Authorizations

There are several Special Use Authorizations in the project area for access roads, gates, telephone lines, power lines, a stream gauge, and a water tank and associated waterlines. The permittees include private citizens, local water agencies, and large corporations such as Pacific Gas and Electric Company and Pacific Bell Telephone Company. No new authorizations are known to exist in the project area.

3.9.3.5 Notices of Intent and Plans of Operation

Currently, there are no known Notices of Intent or Plans of Operation on file for any mineral operations in the project area.

3.9.4 Existing Conditions: Indicator 1 — ROS/VQO

The ROS details approximately 50 percent of the project area as Roaded Modified, with the remaining 50 percent somewhat equally divided between Roaded Natural and Rural.

Approximately 50 percent of the project area has a VQO of Modification, while the remaining 50 percent is divided almost equally between Retention and Partial Retention.

3.9.5 Environmental Consequences: Indicator 1 — ROS/VQO

3.9.5.1 Alternative A (No Action)

Direct and Indirect Effects. The no-action alternative would not initiate human-caused changes to the existing scenic conditions of the Slapjack Project area, except for wildland fire suppression. No timber harvest, road construction, road decommissioning, dispersed campsite improvement, or prescribed burning would be scheduled. The natural evolution of the vegetative component of the landscape would continue to change the scenic qualities of the area. The potential for catastrophic wildfire, along with the inherent changes in visual character, would continue to increase.

Cumulative Effects. There would be no cumulative effects.

Alternative A (No Action)
- No treatments would be implemented.

Alternative B (Proposed Action)
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres), mechanical and manual methods, and prescribed burning

Alternative C
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Alternative D
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds with herbicides (up to 31 acres)

Alternative E
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds without herbicides

Alternative F
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres)

Alternative G
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

3.9.5.2 All Action Alternatives

Direct and Indirect Effects. Action alternatives B, C, D, E, F, and G propose various amounts of vegetation management. Current VQOs would remain the same at the Moderate Modification level, which is 50 percent of the project area. Current VQOs of Retention would be met in all action alternatives because the types of proposed harvest activities would be designed to be visually unobtrusive.

Cumulative Effects. Past vegetation and transportation activities have influenced the current recreation, land, and mineral opportunities and use of the Slapjack Project area, so their effects are part and parcel of the existing conditions described above. There are no expected cumulative effects for any of these alternatives for the existing array of recreation, land, and mineral opportunities beyond the anticipated increase in dispersed recreational use.

3.9.6 Existing Conditions: Indicator 2 — Special Use Authorizations

There are several known Special Use Authorizations issued for nonfederal land uses in the project area. These authorizations are for access roads into private property (some with gates), several miles of power lines and telephone lines, and a water tank and associated waterline. These features would require protection during the layout and implementation of the Slapjack Project. There are no known new proposals now or in the reasonably foreseeable future.

3.9.7 Environmental Consequences: Indicator 2 — Special Use Authorizations

3.9.7.1 Alternative A (No Action)

Direct and Indirect Effects. The no-action alternative would not initiate human-caused changes in the project area except for wildland fire suppression. No timber harvest, road construction, road decommissioning, dispersed campsite improvement, or prescribed burning would be scheduled. The natural evolution of the vegetative component of the landscape would continue to change the scenic qualities of the area. The potential for catastrophic wildfire would continue to increase.

Cumulative Effects. There would be no cumulative effects from alternative A.

3.9.7.2 All Action Alternatives

Direct and Indirect Effects. Action alternatives B, C, D, E, F, and G propose various amounts of vegetation management. Known special use improvements would require contractual protection. With the required protection of these improvements, there would be no direct or indirect effects with implementation of this mitigation measure.

Cumulative Effects. Past vegetation and transportation activities have influenced the current opportunities and use of the Slapjack Project area, so their effects are part and parcel of the existing conditions described above. There are no expected cumulative effects for any of these alternatives for the existing array of other opportunities, beyond the anticipated increase in other recreational use.

3.9.8 Past, Present, and Reasonably Foreseeable Future Actions

The proposed Defensible Fuel Profile Zone (DFPZ) treatments for this project would be part of the network of other DFPZ projects currently being implemented or proposed on National Forest System lands in the area. A future project includes a roadside noxious weed risk assessment. There are several timber harvest plans on private lands within the Slapjack Project boundary. There are no known additional recreational uses, Special Use Authorization proposals, or mineral entries in the reasonably foreseeable future in the project area.

3.9.9 Summary of Cumulative Effects

Past vegetation and transportation activities have influenced the current recreational, land, and mineral opportunities and use in the Slapjack Project area, so the effects of the activities are part and parcel of the existing conditions described above. There would be no other cumulative effects associated with alternative A beyond the anticipated increase in use, especially recreation.

The action alternatives would not exclude any of the existing uses but could modify the amount of recreational access. The proposed transportation management activities would slightly reduce the level of OHV access. This would primarily be through road closing or decommissioning following the OHV route inventory and designation process. The proposed transportation management activities are discussed in more detail under “Transportation System” (section 3.11 in this EIS).

Past vegetation management activities in the project area have left vegetation in various stages of recovery. Impacts of past activities on the visual quality of sensitive travel routes become less evident as vegetation continues to recover. There are no expected cumulative effects on visual resources from the proposed vegetation and transportation management activities because the adopted VQOs for the area would be met.

3.10 Soils

3.10.1 Regulatory Framework

3.10.1.1 National Forest Management Act

The *National Forest Management Act of 1976* (see appendix G of this EIS for the findings) mandates that land management plans be prepared for each National Forest (see the *Plumas National Forest Land and Resource Management Plan* discussion), and that guidelines be specified that

> Insure research on and (based on continuous monitoring and assessment in the field) evaluation of the effects of each management system to the end that it will not produce substantial and permanent impairment of the productivity of the land.

and

> Insure that timber will be harvested from National Forest System lands only where-
>
> (i) soil, slope, or other watershed conditions will not be irreversibly damaged.

3.10.1.2 Plumas National Forest Land and Resource Management Plan

The 1988 *Plumas National Forest Land and Resource Management Plan* (commonly referred to as the "Forest Plan") specifies standards and guidelines for the maintenance and improvement of soil resources (USDA Forest Service 1988). These standards and guidelines are described in detail in the "Slapjack Soils Report" on file in the project record.

3.10.1.3 Region 5 Soil Management Handbook

The Forest Service Region 5 Soil Management Handbook establishes standards for soil quality and analysis. These standards provide threshold values that indicate when changes in soil properties and soil conditions would result in significant change or impairment of the productivity potential, hydrologic function, or buffering capacity of the soil. Detrimental soil disturbance is the resulting condition when thresholds are exceeded. The handbook states that the extent of detrimental soil disturbance that affects soil productivity, shall not be of a size or pattern that would result in a significant change in production potential for the activity area (USDA Forest Service 1995). Detrimental soil disturbance indicators include soil productivity, soil hydrologic function, and soil buffering capacity. Region 5 also directs additional standard mitigation measures—the B and C clauses that are standard with every harvest contract. Detailed descriptions of all standards and mitigation measures contained in the handbook are included in the "Slapjack Soils Report" on file in the project record and in appendix F of this EIS.

3.10.2 Methodology for Assessing Impacts on Soils

3.10.2.1 Scope of Analysis

The scope of the analysis for direct, indirect, and cumulative effects on soils is limited to the Slapjack Project area. The proposed treatment units were surveyed in the spring and fall of 2004 and early summer 2005. All treatment units where mechanical treatment is proposed were surveyed for ground cover, compaction, and organic matter.

3.10.2.2 Analysis Methods for Herbicide Use

Existing Condition. It was assumed that under the existing condition, herbicide presence in the Slapjack Project area is negligible or nonexistent. No herbicides have been applied on Plumas National Forest lands since 1983, with the possible exception of some units of the Challenge Experimental Forest. At present, data are not available for any Experimental Forest application, but the data will be sought for the final EIS on the Slapjack Project. Herbicide migration through soils or other pathways from adjacent private lands is likely minimal and was not analyzed.

Project Effects. Soil types and textures, as mapped and described in the Plumas National Forest Soil Resource Inventory (1988b), were used to identify the properties of soils in the Slapjack Project area. These descriptions were used in combination with the field-described soil properties of the proposed treatment units to evaluate the potential for herbicide effects on soils. These data include texture, effective ground cover, and Erosion Hazard Rating. The general effects of herbicides with respect to soil properties and indicators are described in section 3.10.4 of this EIS.

3.10.2.3 Indicator Measures

Indicator 1: Soil Productivity. Soil productivity is the inherent capacity of a soil to support growth of plants, plant communities, and soil biota (USDA Forest Service 1995). The important measures of soil productivity include soil cover, soil porosity, and organic matter.

Measure 1: Soil Cover – An effective soil cover consists of low-growing vegetation (grasses, forbs, and prostrate shrubs), plant and tree litter (fine organic matter), and surface rock fragments. Soil cover may also include applied mulches (straw or chips) (USDA Forest Service 1995). Vegetative cover serves several purposes in the mitigation of accelerated soil erosion (California Soil Survey Committee 1989). Effective ground cover was measured in field surveys, and the Erosion Hazard Rating (EHR) system was used to quantify the kind, amount, and allowable disturbance of soil cover necessary to prevent detrimental accelerated soil erosion (USDA Forest Service 1988b).

- **Direct effects** on this measure include the removal of an effective soil cover.
- **Indirect effects** on this measure include the removal of an effective soil cover which induces accelerated soil erosion. Groundcover dissipates the energy of falling raindrops through interception. At higher velocities, falling rain causes rain splash, a force that detaches and mobilizes soil particles. The litter layer absorbs water and increases storage capacity and slows the velocity of overland flow. High-velocity overland flow occurs as sheet-wash, another erosive force. Without vegetative cover, an intense storm can generate

large quantities of sediment from hillslopes (Cawley 1990). Removing ground cover also reduces habitat for macro/microorganisms and removes the soil temperature and moisture buffer.

- **Cumulative effects** on this measure are assessed using the EHR. The 1988 Forest Plan gives direction on the limitations of timber harvest activities with respect to soil cover. The EHR is used to determine the minimum effective ground cover needed to maintain productive soils in healthy timber stands.

Measure 2: Soil Porosity – Soil porosity, which is the volume of pores in a soil that can be occupied by air, gas, or water, varies depending on the size distribution of the particles and their arrangement with respect to each other. The measure used to assess soil porosity is compaction, which was collected during field surveys.

- **Direct effect** on this measure is the increase of soil compaction. The use of heavy forestry equipment and frequent stand entries increases the potential for soil compaction (Powers 1999), which increases bulk density and decreases the porosity of soils.

- **Indirect effects** of soil compaction include slowed plant growth, impeded root development, poor water infiltration, restricted percolation, and increased overland flow during high precipitation events. Compaction may increase soil strength, causing vegetation to use more energy to access nutrients and water, and resulting in poorer vegetation cover. Under compacted conditions, less soil volume is available for roots and mycorrhizal fungi to occupy, and plant nutrients are relatively immobile. The effects of compaction on tree growth are well documented (Poff 1996). The degree and extent of susceptibility to compaction is primarily influenced by soil texture, soil moisture, depth of surface organic matter, ground pressure weight of the equipment or bole, and whether the load is applied in a static or dynamic fashion.

- **Cumulative effects** on compaction could occur if project activities, combined with past or future foreseeable actions, were to result in an unacceptable proportion of the landscape experiencing detrimental compaction.

Measure 3: Organic Matter – The organic matter of forest soils can be grouped into two types: soil organic matter and surface organic matter, which is further divided into fine organic material and large woody debris. Fine organic material includes plant litter, duff, and woody material less than 3 inches in diameter. Data for both fine organic matter and large woody debris were collected during field surveys.

Soil organic matter is the cache for plant nutrients and is the primary source of plant-available nitrogen, phosphorous, and sulfur. Soil organic matter provides habitat for all of the diverse organisms in soil that carry out energy transformation and cycle nutrients. It is also responsible for the strong granular structured and high porosity in healthy forest soils. Organic matter increases water storage capacity and encourages higher infiltration rates. Accumulated duff and litter moderate soil temperature and moisture, providing an environment favorable for the macroinvertebrates that recycle plant and animal remains. Surface organic material also protects soils from erosion, enhances infiltration, and hydrologic function. Large woody debris decays slowly, providing a structural habitat

for organisms that fix nitrogen and an excellent growth medium for mycorrhizal fungi. Surface organic matter was assessed through field surveys. For the analysis of organic matter, effects are categorized as follows:

- **Direct effects** on this indicator include the removal of organic matter.
- **Indirect and cumulative effects** include the reduction of soil nutrients and loss of habitat for organisms inhabiting organic matter.

Indicator 2: Hydrologic Function. Hydrologic function of soils was assessed with respect to runoff potential. Accelerated surface runoff is associated with reductions in infiltration and permeability. Soil porosity standards (see above) are used to achieve this objective (USDA Forest Service 1995). The areal extent of existing and projected soil disturbance, compared to a threshold of disturbance where detrimental effects on hydrologic function may occur within a given watershed, is determined by the application of the Forest Service Region 5 Cumulative Watershed Effects Assessment. This analysis was performed and is included in the "Hydrology Report" for the Slapjack Project.

Indicator 3: Soil Buffering Capacity. Soil buffering capacity refers to the soil's resilience to factors that cause a significant change in pH. Buffering capacity is largely driven by cation (a positive ion) exchange capacity. Materials added to the soil must not alter soil reaction class, buffering or exchange capacities, or microorganism populations to the degree that significantly affect soil productivity, bioremediation potential, soil hydrologic function, or the health of humans or animals (USDA Forest Service 1995).

Herbicides and Soil Quality – All Indicators. The response of all indicators and measures to the proposed herbicide use is evaluated separately from the effects of other proposed treatment methods (mechanical, thermal, hand); see sections 3.10.4.1 to 3.10.4.9 below.

3.10.2.4 Field Data Collection

Data were collected to estimate soil cover, compaction, and organic matter content throughout the proposed treatment area. All units where mechanized ground-based equipment use is proposed were sampled. Units proposed for underburn treatments or cable logging were not sampled. Data collection included point sampling in treatment units along systematic randomized transects, which were designed to sample the geographic and topographic extent and variation of treatment units. Because soil transects were surveyed prior to marking of groups selection units, areas that were designated as available for group selection were surveyed rather than the final individually marked units. Group selection areas located within the boundaries of Defensible Fuel Profile Zones (DFPZ) were included with the surveys of the DFPZs. The information collected in a group availability area was applied as a uniform average to any groups that were later laid out in that area. Since DFPZ treatment units were also surveyed prior to their final boundary designations, where some of these units were later split, data are reported as the aggregate average for the units composing the original treatment area.

Transect locations were initially determined using a topographic map and modified in the field to ensure collection of the necessary information. Transect length, number of sample points, distance

between sample points, and number of transects required for adequate sample size were determined using the topographic map scale. Sample size depended on unit variation and size and included at least 15 sample points. Information on slope, soil texture, detrimental soil compaction, ground cover, soil disturbance, and large woody debris was recorded along transects. For a more detailed discussion of field methods, refer to the "Slapjack Soils Report" in the project record. The proposed treatment units are displayed in figure A-1 in appendix A of this EIS.

3.10.2.5 Erosion Hazard Rating

The Erosion Hazard Rating (EHR) was determined for each unit surveyed. The EHR is a risk assessment of specific soil factors that induce accelerated erosion (USDA Forest Service 1990). The purposes of the EHR are to (1) evaluate the likelihood of accelerated sheet and rill erosion from a specific soil disturbing activity, (2) evaluate the risk for adverse consequences, and (3) identify approximate soil cover amounts needed to achieve an acceptable risk. The EHR was computed using the California Soil Survey Committee Erosion Hazard Rating Computation Form (CSSC 1989). The form is based on four components: soil erodibility factors, runoff production factors, runoff energy factor, and soil cover factors. These components are described in detail in the "Slapjack Soils Report" on file in the project record.

3.10.3 Affected Environment (Existing Conditions): Soils

3.10.3.1 Physical Framework

Physiography. The Slapjack Project area lies within the Sierra Nevada geologic and geomorphic province. The Feather River and Yuba River watersheds comprise the majority of the Plumas National Forest and wholly contain the project area. These are the northernmost major rivers draining the west slope of the Sierra Nevada. The topography of the Yuba-Feather River region is relatively subdued in comparison to the higher, more rugged relief of the range further south. Peaks in the area do not exceed 7,000 to 8,000 feet at a maximum. The western slope of the Sierra Nevada in this region is characterized by broad, rolling highlands incised by steep river canyons and their tributary streams. The highest elevation in the watersheds analyzed for the project is 4,160 feet on Peterson Ridge in the northeastern most portion of the area. The lowest elevation at Lake Oroville is 900 feet at full pool. Total relief of the project area watersheds is approximately 3,200 feet. The greatest relief in the area occurs in the canyons of the South Fork Feather River and the North Yuba River (north arm of Bullard's Bar Reservoir), with ridge crest-to-channel elevation differences of approximately 2,000 feet in 1 mile. Steep side slopes in these canyons exceed 100 percent gradients in some areas. Gently convex ridge top areas between the major canyons break abruptly to steep tributary canyons. The proposed treatment units for the Slapjack Project would be distributed across all elevations of the watershed area, ranging from about 1,000 feet to over 3,500 feet. The proposed DFPZ harvest and mastication units would generally be situated in upland positions with gently to moderately sloping topography, but some group selection and underburn units would be located on steeply sloping ground.

Geologic Composition. The bedrock geology of the watershed area is comprised proportionally of approximately 63 percent metamorphic rocks and 37 percent intrusive rocks. Tertiary volcanic rocks are not exposed in the project area. The metamorphic rocks consist largely of metavolcanics of

the Jurassic Smartville Complex, which occupy the bulk of the west central and southern portions of the watershed area. A smaller area of older Central Belt metasediments of the Slate Creek and Fiddle Creek complexes occurs in the eastern portion of the analysis area (Fagan et al. 2001). Ultramafic ophiolitic melange associated with Central Belt terranes occurs in the north central portion of the area and serpentinitic rocks are associated with this unit. Gabbroic intrusive rocks of the Swedes Flat and Indiana Creek plutons associated with the Smartville Complex occur in the western portion of the area southwest of Forbestown and south of Challenge (Beard and Day 1986). Granitic intrusions occur around New Bullard's Bar Reservoir (Yuba River pluton), northwest of Ponderosa Reservoir (Bald Rock pluton), and in the northeastern portion of the area (Cascade pluton) (Irwin 2003).

Glaciation. The watershed area lies below the elevation of late Pleistocene glaciation, and no evidence of glacial geomorphic features are found in the area.

Slope Instability and Sediment Sources. The distribution of slope instability within the watershed area is not well known at this time. Areas in the inner canyons of the South Fork Feather River and North Yuba River (north arm of New Bullard's Bar Reservoir) are over steepened and may experience inner gorge land sliding and rock fall. Steep tributary streams, particularly first- and second-order channels in canyon side slope settings appear prone to debris flows, particularly following disturbance induced by wildfire and low-recurrence interval high-intensity precipitation events. Outside of these over steepened areas, mass wasting does not appear to be a dominant source of sediment in the area. Sheet and rill erosion and channel incision contribute sediment, probably to the greatest extent following disturbance by fire and large storms. Roads, and to a somewhat lesser degree timber harvest, appear to be the primary human-caused sediment sources on the modern landscape.

Soil Types and Map Units. Soil map units in the project area are identified in the Plumas National Forest Soil Resource Inventory (Churchill 1989), which is an Order 3 soil survey. Forty-seven Order 3 map units are included within the project area boundary. The map units, with their areal extent and proportion of the project area, are included in the "Slapjack Soils Report" on file in the project record. The project area falls entirely within general soil map unit 8, Aiken-Josephine. The landscape of general soil map unit 8 is described within a group of landscapes described as "Dominantly nearly level to very steep soils that are moderately well to well drained." The Aiken-Josephine group is further described as "Gently sloping to very steep, deep, moderately well drained, loamy or clayey soils on toe slopes and steep side slopes." The soils in the survey area consist of about 50 percent Aiken soils and 35 percent Josephine soils, with the remainder composed of Holland soils, basic soils, and ultic haploxeralfs. These proportions are roughly accurate for the project area, with a somewhat lower proportion of Josephine soils present, and a somewhat greater area of Holland soils. Texturally, Aiken soils are dominantly clayey, especially in the subsoil; Holland soils are clay-loamy; and Josephine soils are loamy to clay loamy. Aiken soils are highly susceptible to rutting and compaction; Holland soils are highly susceptible to compaction; and Josephine soils are moderately susceptible to rutting and compaction. These soils are considered at high risk for reduced site productivity due to compaction, if heavy equipment operation occurs when soils are wet. Holland soils are highly erodible and subject to mass instability, gullying, and surface erosion. Together, these three soil families occupy about 70 percent of the project area. Chaix, Clallam, Dubakella, and Wapi soil families are minor representatives, with 5 percent or less of the project area occupied by each. A table of all soil families located in the Slapjack Project area is located in the "Slapjack Soils Report."

3.10.3.2 Existing Condition: Indicator 1 — Soil Productivity

The existing condition assumes no herbicide presence in soils in the Slapjack Project area, as described above.

Existing Condition: Measure 1 – Soil Cover. The percent of effective ground was measured through field surveys and the EHR is used to determine the kind, amount, and disturbance of soil cover necessary to avoid detrimental accelerated soil erosion (USDA Forest Service 1995). The Forest Plan requires the Forest Service, during project activities, to minimize excessive loss of organic matter and limit soil disturbance according to the EHR as follows: (1) EHR 4-8: Conduct normal activities, (2) EHR 9-10: Minimize or modify use of soil-disturbing activities, and (3) HER 11-13: Severely limit soil-disturbing activities. The Forest Plan also directs the determination used to assess adequate ground cover for disturbed site using the following as a guide: (1) Low EHR (4-5): 40 percent minimum effective ground cover, (2) Moderate EHR (6-8): 50 percent minimum effective ground cover, (3) High EHR (9-10): 60 percent minimum effective ground cover, and (4) very high EHR (11-13): 70 percent minimum effective ground cover.

For all proposed treatment types, the EHRs are below the numerical value of 8. According to the Forest Plan guidelines, the Plumas National Forest can conduct normal activities. The majority of the DFPZ treatment units have a low EHR. Unit 5 is the only DFPZ unit with a moderate rating, and none of the units have a high rating. All of the proposed group selection treatment areas have a low EHR. For a detailed description of the existing condition for each treatment unit surveyed, refer to the "Soils Report" on file in the project record.

Existing Condition: Measure 2 – Soil Porosity. The Forest Plan states that to avoid land base productivity loss due to soil compaction, no more than 15 percent of timber stands are to be dedicated to landings and permanent skid trails. The majority of the proposed DFPZ treatment units are below 15 percent compaction. Units 52, 152, 402, 9401, and 53 are 22 percent compacted and exceed the maximum standard. These units occupy 175 acres, or 3.8 percent of the proposed DFPZ treatment area. For a detailed description of the existing condition for each treatment unit surveyed, refer to the "Soils Report" on file in the project record.

All of the individual tree selection units and the majority of the group selection areas are below 15 percent compaction. Units 4 (18 percent compacted), 5 (26 percent compacted), and 15 (20 percent compacted) exceed the maximum standard. These units occupy 50 acres, or 7.4 percent of the area available for group selection. For a detailed description of the existing condition for each treatment unit surveyed, refer to the "Soils Report" on file in the project record.

Existing Condition: Measure 3 – Organic Matter. Fine organic matter includes plant litter, duff, and woody material less than 3 inches in diameter. Forest Service Region 5 standards require that (1) fine organic matter occurs over at least 50 percent of the area; (2) large woody debris is at least five well-distributed logs per acre, representing the range of decomposition classes; and (3) desired logs are at least 20 inches in diameter and 10 feet long (USDA Forest Service 1995).

The existing conditions in all proposed DFPZ units exceed the regional standard for amount of fine organic matter. Twenty-two DFPZ treatment units do not meet the standard for amount of large woody debris (units 4, 5, 6, 26, 29n, 29s, 32, 47, 48, 52, 63, 64, 82, 84, 85, 91, 96, 97, 98, 159, 229,

and 284). For a detailed description of the existing condition for each treatment unit surveyed, refer to the “Slapjack Soils Report” on file in the project record.

Group selection treatment area 27 is just below the standard for fine organic material. Group selection treatment area 4, 26, and 35 and individual tree selection treatment unit 25 do not meet the standard for amount of large woody debris. For a detailed description of the existing condition for each treatment unit surveyed, refer to the “Slapjack Soils Report” on file in the project record.

3.10.3.3 Existing Condition: Indicator 2 — Hydrologic Function

Hydrologic function of soils is assessed with respect to runoff potential. Accelerated surface runoff is associated with reductions in infiltration and permeability. Soil porosity standards (see above) are used to achieve this objective (USDA Forest Service 1995). The areal extent of existing and projected soil disturbance, compared to a threshold of disturbance where detrimental effects on hydrologic function may occur within a given watershed, is determined by the application of the Forest Service Region 5 Cumulative Watershed Effects Assessment. This analysis was performed and is included in “Hydrology Report” for the Slapjack Project.

3.10.3.4 Existing Condition: Indicator 3 — Soil Buffering Capacity

The soil buffering capacity of soils within the project area is unknown, but it is probably not outside the range of natural variability for the landscape. No large wildfires or widespread applications of chemicals that might affect soil pH, cation exchange capacity, or nitrogen availability have occurred within most of the project area. Areas within the Pendola fire in the southernmost portions of the project area may have experienced alterations in soil chemistry immediately following the fire, but reforestation activities and natural vegetation recovery within the last five years have likely restored pH resiliency to levels resembling pre-fire conditions. It is unknown at this time if experimental herbicide application within the Challenge Experimental Forest may have affected soil buffering capacity.

3.10.3.5 Herbicides and Soil Quality — All Indicators

It is assumed that under the existing condition, herbicide presence in the Slapjack Project area is negligible or nonexistent. No herbicides have been applied on Plumas National Forest lands since 1983, with the possible exception of some units of the Challenge Experimental Forest. At present, data are not available for any Experimental Forest application, and these data would be sought out for the final EIS on the Slapjack Project. Herbicide migration through soils or other pathways from adjacent private lands is likely minimal and was not analyzed. Consequently, under the existing condition, the project area is assumed to be largely free of herbicide chemicals or their degradate byproducts, and to be in reference condition with respect to the effects of herbicides on soil quality indicators.

3.10.4 Environmental Consequences

3.10.4.1 Alternative A (No Action): General Effects on Soils from Proposed Herbicide Treatments

Implementation of the no-action alternative (alternative A) would not result in adverse effects on any of the indicators or measures because herbicides are currently not used in the project area.

3.10.4.2 All Action Alternatives: General Effects on Soils from Proposed Herbicide Treatments

Herbicide treatments for DFPZ maintenance would be performed by manual ground application of imazapyr (Arsenal® AC) using backpack sprayers. The formulation would also include a surfactant (Syl-Tac®) and a dye (Hi-Light® Blue). Herbicide treatments for noxious weed control would be performed by manual ground application of triclopyr BEE (Garlon 4™) using backpack sprayers. The same surfactant and dye used with triclopyr would be used with imazapyr applications for DFPZ maintenance, although at double the application rate compared to imazapyr. The proposed rates and volumes for each herbicide for each application type are listed in tables C-1 and C-2 in appendix C of this EIS.

Alternative A (No Action)
- No treatments would be implemented.

Alternative B (Proposed Action)
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres), mechanical and manual methods, and prescribed burning

Alternative C
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Alternative D
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds with herbicides (up to 31 acres)

Alternative E
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds without herbicides

Alternative F
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres)

Alternative G
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

The Best Management Practices (BMPs) designed primarily to reduce or eliminate any risk from herbicides to aquatic ecosystems and other sensitive habitats and species would be enforced for the Slapjack Project. To ensure these BMPs are met, monitoring plans for the presence and concentration of herbicides in soil, surface water, and groundwater would be applied. These plans would include baseline monitoring prior to the first herbicide applications to establish baseline conditions and to assess the risk of cumulative effects. Refer to the “Hydrology Report” on file in the project record for more information on BMPs and Monitoring Plans.

Both imazapyr and triclopyr are described as being relatively persistent in soils, and both have been found in most studies to have minimal mobility and leaching potential in soils, although some variability has been cited. Evidence cited in the Forest Service Region 5 final EIS for vegetation management (USDA Forest Service 1989) indicates that moderate to high soil organic matter and clay content are primary factors that reduce the persistence and mobility of herbicides. The majority of the

soils in the study area have clayey subsoils, and organic matter is abundant throughout the project area, suggesting that herbicide persistence and mobility in soils in the Slapjack Project area would be low.

3.10.4.3 Alternative A (No Action): General Effects of Herbicides on Overall Treatments on Indicator 1 — Soil Productivity

There would be no effects on Indicator 1 and associated measures because herbicides are currently not used in the project area, and there is no potential for soil productivity changes related to herbicides because no treatments would be implemented.

3.10.4.4 Action Alternatives: General Effects of Herbicides on Indicator 1 — Soil Productivity

Measure 1 – Soil Cover. In general, soil cover is likely to increase as a consequence of herbicide application. Some short-term reduction in the herbaceous component of ground cover may occur; this is a minor component of overall ground cover in most areas. The vegetation killed by herbicides would remain on site and provide ground cover to prevent soil erosion and would eventually become incorporated into the soil organic matter constituent. Material resting directly on the ground surface generally provides more effective erosion protection than canopy cover. The dead vegetation resulting from herbicide application would become incorporated in the ground surface layer more rapidly and may assist in providing ground cover in areas where canopy and soil cover is depleted by mechanical or thermal treatments.

Measure 2 – Soil Porosity. Herbicide application is not expected to have measurable or significant effects on soil porosity.

Measure 3 – Soil Organic Matter. In general, soil organic matter is likely to increase as a consequence of herbicide application. The vegetation killed by herbicides would remain on site and provide ground cover to prevent soil erosion and would become incorporated into the soil organic matter constituent.

3.10.4.5 Alternative A (No Action): General Effects of Herbicides on Indicator 2 — Hydrologic Function

There would be no effects on Indicator 2 and associated measures because no treatments would be implemented.

3.10.4.6 All Action Alternatives: General Effects of Herbicides on Indicator 2 — Hydrologic Function

Direct, Indirect, and Cumulative Effects. Soil disturbance, which can alter hydrologic function, reduce porosity, increase overland flow, and change Equivalent Roaded Area (ERA) values, would likely be minimal as a result of herbicide application. The loss of live vegetation and root strength

would likely be compensated by the addition of ground cover and protective soil organic matter. The ERA model and risk of cumulative watershed effects are calculated in the "Hydrology" section (3.8) of this EIS, and herbicide application is not considered a measurable factor for these calculations.

3.10.4.7 Alternative A (No Action): General Effects of Herbicides on Indicator 3 — Soil Buffering Capacity

Direct, Indirect, and Cumulative Effects. There would be no effects on Indicator 3 and associated measures because no treatments would be implemented.

3.10.4.8 All Action Alternatives: General Effects of Herbicides on Indicator 3 — Soil Buffering Capacity

Direct, Indirect, and Cumulative Effects. This indicator includes effects on microorganism populations. It is conceivable, but unlikely, that proposed herbicide application might observably affect soil microorganisms. The soil buffering capacity of soils in the project area is not known, but it is not expected that soil buffering capacity would be changed by the proposed management activities. No materials would be added to soil that would alter reaction classes, buffering, or exchange capacity.

The SERA risk assessments for imazapyr (SERA 2004b) and triclopyr (SERA 2003) both indicated low risk of impacts on soil microbial function. In the case of both products, experimental concentrations that had significant effects on most test organisms substantially exceeded the long-term modeled soil concentrations of these chemicals. For imazapyr, the effective concentration also exceeded the peak modeled soil concentration by a factor of four. Under laboratory conditions, triclopyr has a very high degree of variability in soil microorganism response. Peak modeled soil concentrations of triclopyr exceed the No Observed Adverse Effects Level (NOAEL – see the "Glossary" for a definition) for some soil bacteria and fungi. Thus, it is possible that the balance of species composition of microbial soil communities might change, but the SERA risk assessment concludes that "substantial impacts on soil—that is, the gross changes in the capacity of soil to support vegetation—do not seem plausible" (SERA 2004b). Field evidence bears out that there is not substantial damage to vegetation-supporting characteristics of soil microorganisms from application of these herbicides because associated losses in soil productivity and vegetation vigor have not been observed.

The surfactant Syl-Tac® may affect soil adsorption and movement properties of the herbicides that it is mixed with, although specific studies of this surfactant are not available. The general conclusion has been that extremely high concentrations of surfactants, perhaps present in a spill scenario, would have to be present to affect the mobility of herbicides in soil or their effects on soil microorganisms. It is unlikely that Syl-Tac® presents a significant risk of adverse environmental effects on soil microorganisms and soil productivity.

The dye, Hi-Light® Blue, is not a registered pesticide and has no label signal word. It is water-soluble and contains no listed hazardous substances. It is considered virtually nontoxic to humans, and no known toxic effects on aquatic or terrestrial species have been documented. It is commonly used in toilet bowl cleaners and as a colorant for lakes and ponds (Bakke 2002). It is unlikely that

Hi-Light® Blue presents a significant risk of adverse environmental effects on soil microorganisms and soil productivity.

The potential herbicide effects on indicators of soil quality are described below by alternative. Where no effects are likely, as discussed above in the "General Effects" sections for the action alternatives, specific effects on indicators by alternative are not described.

3.10.4.9 Alternative A: Effects on Indicator 1 — Soil Productivity

Direct, Indirect, and Cumulative Effects. Under alternative A, the Slapjack Project would not be implemented, and no environmental effects associated with the application of herbicides would occur, including any that might affect soil quality indicators.

3.10.4.10 Alternative A: Effects on Measure 1 — Soil Cover

Direct Effects on Measure 1 – Soil Cover. The no-action alternative would allow effective soil cover to remain in the Slapjack Project area. However, a catastrophic wildfire, which may occur if the no-action alternative is chosen, would remove effective soil cover.

No improvement activities would occur, so there would be no new management sources of surface erosion from transportation improvements, meadow enhancements, fish barrier removals, or streambank stabilization.

Indirect Effects on Measure 1 – Soil Cover. The no-action alternative would allow effective soil cover to remain. However, a catastrophic wildfire could be a potential result of the no-action alternative. A catastrophic wildfire would remove effective soil cover and increase runoff potential. A high-intensity fire could also rapidly mineralize and volatilize nutrients contained in soil cover, which could then be lost from the site, thereby reducing soil productivity.

Cumulative Effects on Measure 1 – Soil Cover. The no-action alternative would allow effective soil cover to remain. However, a catastrophic wildfire is a potential result of the no-action alternative. The EHR was used to assess potential cumulative impacts related to the existing soil cover condition and the minimum effective ground cover needed to maintain productive soils in healthy timber stands. As described above in section 3.10.1.5, the EHR is based on four components, but the two components discussed below could change due to a catastrophic wildfire.

Component 2: Runoff Production Factors – The factors in this component that could be affected include water movement through soil and uniform slope length. The effects on soil water transport might include reductions in infiltration, porosity, and depth to constricting layers. A catastrophic wildfire could induce the formation of hydrophobic soil layers (soils not absorbed or easily mixed with water), thus increasing runoff and erosion in the short term. A wildfire may increase uniform slope length by decreasing the size and number of large pieces of down wood, which would also increase surface runoff and erosion.

Component 4: Soil Cover Factors – The factors in this component that could be affected include quantity and quality of ground cover and cover distribution of organic matter. Quantity and quality is

a combination of overstory cover and ground cover, with ground cover providing the majority of surface erosion protection. A catastrophic wildfire would cause a large reduction in ground cover, thereby increasing erosion risk. A catastrophic wildfire would affect cover distribution of organic matter, with a short-term reduction followed by replenishment with needle-cast from scorched trees.

3.10.4.11 Alternative A: Effects on Measure 2 — Soil Porosity

Direct, Indirect, and Cumulative Effects on Measure 2. No new soil compaction or displacement would occur as a consequence of activities proposed for the Slapjack Project. Previously compacted existing roads, skid trails, and landings would remain compacted. No new detrimental compaction would occur because no new management activities would be implemented. However, a reduction in compaction from mitigation or restoration activities would also not occur.

3.10.4.12 Alternative A: Effects on Measure 3 — Organic Matter

Direct, Indirect, and Cumulative Effects on Measure 3. An accumulation of organic matter would continue at current rates and not be subject to harvest or prescribed fire. However, a catastrophic wildfire could be a potential result of the no-action alternative. A catastrophic wildfire would remove fine organic material and large woody material. This would create a reduction in soil nutrients and a loss of habitat for organisms inhabiting organic matter.

3.10.4.13 Alternative B: Effects on Indicator 1 and Measure 1

Direct Effects on Measure 1 – Soil Cover. The 1988 Forest Plan (the *Plumas National Forest Land and Resource Management Plan*) gives direction on the limitations of timber harvest activities with respect to soil cover. The Erosion Hazard Rating (EHR) is used to determine the minimum effective ground cover needed to maintain productive soils and healthy timber stands, as discussed above in the “Existing Condition” section. Tables describing the maximum amount of soil cover that could be removed for each proposed treatment unit and still meet standards are included in the “Slapjack Soils Report” on file in the project record.

The majority of the units have soil cover exceeding the minimum standards under the existing condition. The proposed DFPZ unit 5 has a moderate EHR, with an existing condition soil cover of 26 percent. This does not meet than the minimum standards for soil cover. The existing condition is due to the Pendola fire. Unit 5 is a proposed mastication unit, and through the mastication process, soil cover would increase, although depending on the equipment used to masticate, ground contact of newly distributed material may not be optimum, and distribution may be patchy. Overall, DFPZ treatments would help reduce impacts that could result from a catastrophic wildfire. DFPZ treatment unit 5 also contains group selection treatment units. The Forest Plan requires a minimum effective ground cover of 50 percent in this unit. All of the proposed group selection and individual tree selection units contain an effective soil cover above the minimum standards under the existing condition. Group selection and individual tree selection treatments are designed to promote the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) desired condition of uneven-aged (all-aged) fire-resilient stands, while maintaining a healthy forest. Soil cover in all

treatment units would meet or exceed standards through the use of standards, guidelines, mitigation measures, and BMPs listed in the "Slapjack Soils Report" on file in the project.

As described above in the "General Effects" section, there would be no anticipated significant adverse environmental effects from the proposed herbicide use under alternative B. Herbicide application may temporarily reduce the herbaceous component of ground cover, which is a minor constituent of overall soil cover in most areas.

Indirect Effects on Measure 1 – Soil Cover. The proposed treatment units in the Slapjack Project area are at risk of soil cover loss. The proposed DFPZ treatments would help reduce impacts that could result from a catastrophic wildfire. Mastication treatment in unit 5 would improve the existing condition and reduce the indirect effects associated with the Pendola fire. In group selection treatment areas and individual tree selection treatment units, soil cover exceeds the minimum standards under the existing condition. Soil cover in all treatment units would meet or exceed standards through the use of standards, guidelines, mitigation measures, and BMPs listed above in the "Soils Report" on file.

Herbicide use should have no detrimental indirect effects on soil cover. Herbicide-killed vegetation would remain as canopy cover in the short term, and soil cover may increase as leaves and eventually woody portions of herbicide-killed vegetation become incorporated in ground cover. Where proposed mechanical and thermal treatments may result in depletion of canopy and soil cover, herbicide application may compensate by providing ground cover as dead vegetation becomes incorporated into the ground surface layer.

Cumulative Effects on Measure 1 – Soil Cover. The EHR is used to determine the minimum effective ground cover needed to maintain productive soils in healthy timber stands. The EHR is based on four components, but two of the components (runoff production and soil cover) could change due to proposed activities.

Component 2: Runoff Production Factors **–** This component assesses water movement in soil and uniform slope length. The proposed treatments could affect infiltration and porosity. Mastication would probably have little effect on soil infiltration, permeability, or depth to constricting layers. A very long-term effect of mastication may be increased soil permeability and associated reduction in bulk density as a result of the infusion of organic matter into the soil. This would have a beneficial effect on soil porosity. Mechanized thinning and biomass removal, group selection, and individual tree selection could affect soil water movement. Heavy equipment may compact soils, thereby reducing surface infiltration and subsurface permeability. The degree and extent of potential compaction would be dependent on equipment type, intensity, and areal extent of equipment travel within harvest units and whether equipment is restricted to well-covered soil areas. Prescribed burning would probably not affect infiltration or porosity. Uniform slope length could be potentially affected. Mastication would probably decrease slope lengths due to increased organic matter on the soil surface. Mechanized thinning and biomass removal, group selection, and individual tree selection would probably not affect uniform slope length because, if large down woody material is available, 10–15 tons per acre would be maintained. Prescribed burning may increase uniform slope length because minimum ground cover retention standards would be met.

Component 4: Soil Cover Factors – Soil cover factors include quantity and quality of ground cover and distribution of soil cover. Quantity and quality is a combination of overstory cover and ground cover, with ground cover providing the majority of surface erosion protection. Any management activity that reduces ground cover would affect this component. DFPZ unit 5 has soil cover that does not meet the minimum standards under the existing condition. Unit 5 is a mastication unit, and mastication removes brush and converts it to ground cover, reducing the risk of net soil cover loss. Mechanized thinning and biomass activities primarily remove overstory and leave understory and ground cover untouched. This potentially increases ground cover due to limbs falling or to de-limbing or bucking on site. The skidding and mechanical operations, however, may reduce ground cover. Prescribed burning may reduce ground cover and increase erosion risk. Loss of ground cover during burning is a function of the fire intensity and resultant burn severity. The prescribed burning is projected to be low-intensity fire, with low risk of ground cover loss. Group selection and individual tree selection would locally remove large quantities of overstory. Cover distribution is a measure of variation in continuity of soil cover. Mastication would probably increase soil cover uniformity by dispersing wood chips around the site during the process. Mechanized thinning and biomass removal would decrease site cover distribution due to vegetation removal. Prescribed burning would likely decrease overall cover and cover uniformity in the short term. Vegetation recovery in burned areas would rapidly restore herbaceous and shrub components of ground cover. In the locations of group selection units, there would be a short-term reduction of soil cover. Regeneration would occur through time and soil cover would return. With increased canopy openings, vegetative cover would rapidly restore the herbaceous and shrub components of ground cover. In proposed group selection treatment area and individual tree selection treatment units, the area of effective soil cover exceeds the minimum standards under the existing condition.

Westmoreland (1999) conducted an in-depth study of the effects of thinning, salvage, and prescribed burns on soil porosity and ground cover on 87 harvest units in the Lassen, Plumas, and Tahoe National Forests. Westmoreland found that most units had high amounts of ground cover before and after treatment, and overall, the treatments reduced the amount of ground cover slightly. The largest change was found following prescribed burning. The effective ground cover following two burns was reduced to approximately 80 percent where a minimum ground cover of 50 percent was the minimum standard. This suggests that the prescribed fire portion of the proposed action would not detrimentally reduce ground cover.

The DFPZ treatments would help reduce impacts that could result from a catastrophic wildfire. Most of the proposed treatment units have an effective ground cover that exceeds minimum standards. Group selection and individual tree selection treatments are designed to promote the HFQLG Act desired condition of uneven-aged (all-aged) fire-resilient stands, while maintaining a healthy forest. Soil cover in all treatment units would meet or exceed standards following project implementation through the use of standards, guidelines, mitigation measures, and BMPs listed in the “Slapjack Soils Report” on file in the project record.

Road decommissioning, as described in the proposed action, would restore the designated land base to a natural state, and increase overall soil cover conditions on existing roadbeds. Fish passage improvements and meadow restoration would not decrease soil cover in areas where ground-based mechanical equipment would not be used. If ground-based mechanical equipment is used, the soil cover would be maintained with the use of standards, guidelines, mitigation measures, and BMPs

listed in the "Slapjack Soils Report" on file. Streambank restoration would increase soil cover on unstable streambanks. Stabilization of streambanks would require enhancement of an effective soil cover to prevent further erosion.

No detrimental cumulative effects on soil cover would occur from herbicide application. Of the two EHR components (Runoff Production Factors and Soil Cover Factors) that may be affected by proposed mechanical, hand, and thermal treatments, there may be some benefits to EHR ratings as a consequence of incorporating more dead vegetation into the ground surface layer, thus reducing uniform slope length and increasing ground cover.

3.10.4.14 Alternative B: Effects on Measure 2 — Soil Porosity

Direct, Indirect, and Cumulative Effects. The use of heavy forestry equipment and frequent stand entries would increase the potential for soil compaction (Powers 1999). The degree of soil compaction varies with soil texture and moisture content, while plant responses to compaction depend strongly on changes in the soil water regime (Gomez et al. 2002). Westmoreland (1999) assessed pre-treatment and post-treatment compaction in 23 harvest units within the Lassen, Plumas, and Tahoe National Forests. Westmoreland's monitoring showed that, prior to harvest, 91 percent of the units sampled (21 of 23 units) exhibited detrimental compaction across 5 percent or less of each unit area. After harvest activities, 70 percent of these same units (16 of 23 units) exhibited detrimental compaction at or exceeding 15 percent of the unit area. When all 23 units were pooled, Westmoreland's data show that the amount of post-treatment detrimental compaction averaged 19 percent of the area of each unit. However, individual units experienced detrimental compaction on as much as 40 percent of the unit's area. This soil monitoring data strongly suggest that forest harvest activities increase the area of ground impacted by detrimental compaction. The results of soil monitoring in 2005 across the HFQLG Pilot Project area support this conclusion (USDA Forest Service 2005). Following treatment, the number of units that were detrimentally compacted increased, especially in group selection units. The majority of units sampled exceeded the Region 5 and Plumas National Forest standards of greater than 15 percent of the area experiencing detrimental compaction post-treatment.

Based on Westmoreland's (1999) findings and the HFQLG monitoring results, the proposed treatment activities under this alternative are expected to increase the amount of detrimental compaction in all units. The extent and degree of compaction, however, would depend on site-specific soil conditions and equipment features. Some proposed treatment units, both DFPZ (harvest) and group selection, currently exceed the compaction standards. In all treatment units, existing landings and skid trails would be used, if possible, and low-ground pressure equipment would be used. New landings and approaches would be subsoiled to a distance of 200 feet from the landing, where compaction is most likely to occur due to repeated passes of equipment over these central, heavily trafficked areas. When properly designed and implemented, subsoiling can be effective in reducing compaction (Kolka and Smidt 2004). Any additional compaction in excess of the allowable standards that may occur in treatment units would be mitigated by applying the standards, guidelines, mitigation measures, and BMPs listed in the "Soils Report."

The proposed improvements to the transportation system (described in chapter 2) would help alleviate the overall extent of detrimental compaction within the project boundary. Road

decommissioning would reduce the total area of compacted roadbed and return these areas to the productive forest land base. Fish passage improvements and meadow restoration would not increase soil compaction where ground-based mechanical equipment would not be used. Where ground-based mechanical equipment is used, standards would be met by applying the standards, guidelines, mitigation measures, and BMPs listed in the "Soils Report." The removal of streamside roads during streambank restoration would reduce detrimental soil compaction on unstable streambanks. Stabilization of streambanks would include enhancements of riparian vegetation, and these measures would reduce compaction as well.

Herbicide application would have no detrimental effects on soil porosity.

3.10.4.15 Alternative B: Effects on Measure 3 — Organic Matter

Direct, Indirect, and Cumulative Effects. The proposed mastication treatments would increase the amount of surface organic matter, resulting in minimal soil displacement. Mechanized thinning, biomass removal, and individual tree selection in treatment units could reduce the amount of total nitrogen available to vegetation, particularly on areas with low site potential. A small portion of this nitrogen is harbored in the tree trunks, while a larger percentage is contained in the actively growing crowns. Thinning from below would remove trees with poorly developed crowns and retain trees with more foliage and a higher percentage of total nitrogen. The overall effect of thinning on the forest ecosystem is not known because a complex balance exists at any site between natural nitrogen accumulations (atmospheric nitrogen, nitrogen-fixing bacteria, and excretions and decomposition from animals) and losses (leaching of nitrates, denitrification, volatilization, and removal of vegetation). It has been found that following thinning, frequently more nutrients become available to vegetation as forest floor temperatures increase, thus enhancing biological activity, accelerating decomposition, and releasing available nutrients. Underburning and pile burning have many of the same impacts that are associated with wildfires, but the effects of prescribed burning are generally less extreme. This is because ignition can be limited to periods when soil moisture is sufficiently high, and weather conditions are within a range conducive to preventing complete consumption of the duff, litter, and large woody debris and to minimizing hydrophobic soil development. Studies show that underburns essentially oxidize the forest floor more rapidly than natural biological processes, removing organic matter and releasing nutrients in forms that recycle more rapidly. Plant growth is stimulated by nutrients released into the ash layer in forms easily cycled by plants. Nitrification is stimulated by underburning, possibly by elevated levels of ammonium and the reduced amount of repressive tannins in the duff and litter. It is not expected that underburning would affect the nutrient budget within the treatment units, if fire intensity and resultant burn severity is maintained within prescription.

In proposed group selection treatment areas, removal of the majority of live overstory would occur, while the understory of shrubs, herbs, and grasses would be retained. A large proportion of all living biomass would be removed from the group selection units, with little retention of standing live trees or the carbon/nutrient pools they represent. Only a small amount of standing live trees would remain to serve as a source for ground cover and fine organic matter until the next generation of overstory trees grow to maturity. The existing dead organic matter would be retained on the forest floor or as remnant standing dead snags, and some residual matter would be sloughed off trees as they

are removed from forest sites, but the majority of overstory biomass would be removed from the forest within the proposed group selection units.

Within the context of the larger forest matrix, the loss of highly localized forest overstory, and the nutrient pools they represent, is not a significant loss to the functioning of the forest ecosystem. The loss of organic matter and soil nutrients would be reduced by applying the standards, guidelines, mitigation measures, and BMPs listed in the "Slapjack Soils Report." In all treatments units, 10–15 tons per acre of large down woody debris (when available) must be maintained—this requirement exceeds soil quality standards.

The addition of new temporary roads, skid trails, and landings would affect organic matter and soil nutrients. Whenever possible, pre-existing skid trails and landings would be used. Construction of landings and use of skid trails would not affect more than 15 percent of the land accessed by mechanical equipment. Fish passage improvements and meadow restoration would not create new losses in organic matter and soil nutrients in areas where ground-based mechanical equipment would not be used. If ground-based mechanical equipment is used, organic matter would meet or exceed the minimum standards with the use of standards, guidelines, mitigation measures, and BMPs listed in the "Slapjack Soils Report." Streambank restoration would reduce the loss of organic matter and soil nutrients on unstable streambanks. Stabilization of streambanks would include the enhancement of riparian vegetation, and the organic matter and soil nutrient levels would increase as vegetative recovery proceeds.

Herbicide application would have no detrimental effects on soil organic matter. Any short-term loss of nitrogen availability from the death of nitrogen-fixing plants, such as broom or *Ceanothus* species, would be replaced by the incorporation of dead vegetation in the soil and the greater availability of solar energy for plant material decomposition. Plant material that is left onsite after herbicide application would become available for organic matter constituents, as opposed to being removed from the ecosystem if biomass treatments are performed.

3.10.4.16 Alternative B: Effects on Indicator 2: Hydrologic Function

Soil disturbance, which can alter hydrologic function and change Equivalent Roaded Area (ERA) values, would likely be minimal as a result of herbicide application. Loss of live vegetation and root strength would probably be compensated by the addition of ground cover and protective soil organic matter. A discussion on the ERA model and risk of cumulative watershed effects (CWE) are provided in the "Hydrology" section (3.8)—herbicide application is not considered a measurable factor for these calculations. The effects related to general soil disturbance associated with project activities are summarized in the results of the ERA model calculations.

3.10.4.17 Alternative B: Effects on Indicator 3 — Soil Buffering Capacity

Direct Effects. The proposed mechanical, thermal, hand, and chemical herbicide treatments are not expected to have any detrimental direct effects on soil buffering capacity.

Indirect Effects. The proposed mechanical, thermal, hand, and chemical herbicide treatments are not expected to have detrimental indirect effects on soil buffering capacity. Herbicide application is

not expected to have any detrimental indirect effects on soil buffering capacity. Some minor changes in the composition and balance of microbial soil communities might occur if they are exposed to high peak concentrations of herbicides, but these conditions are not anticipated, and if experienced, would not observably affect soil productivity.

Cumulative Effects. No detrimental cumulative effects on soil buffering capacity are expected from herbicide application or other proposed treatments. While some minor changes in the composition and balance of microbial soil communities might occur if exposed to high peak concentrations of herbicides, no observable long-term effects on soil productivity are anticipated. For DFPZ treatments, a single application is prescribed, and no background load of herbicide is anticipated. While successive annual applications may occur for noxious weed control, any product remaining onsite after the initial application would probably degrade to concentrations with no potential for cumulative effects by the following year. Triclopyr has generally been found to have minimal mobility in soils, but the HFQLG Act final supplemental EIS lists its half-life as 46 days (USDA Forest Service 2003a). Some studies have indicated longer persistence (SERA 2003), but it is unlikely that sufficient concentrations to produce significant cumulative effects would persist from year to year.

3.10.4.18 Alternative C: Effects on All Indicators

Direct, Indirect, and Cumulative Effects. Herbicide use is not proposed under alternative C, so no environmental effects associated with the application of herbicides would occur, including any that might affect soil quality indicators.

3.10.4.19 Alternative D: Effects on Indicator 1: Soil Productivity / Measure 1 — Soil Cover

Direct Effects. Direct effects would be similar to alternative B, but any herbaceous ground cover loss would be minimal because herbicide use for DFPZ maintenance would not occur.

Indirect Effects. Indirect effects would be similar to alternative B, but herbicide-killed vegetation contributions to ground cover would be minimal because herbicide use for DFPZ maintenance would not occur.

Cumulative Effects. Cumulative effects would be similar to alternative B, but herbicide-killed vegetation contributions to EHR reduction would be minimal because herbicide use for DFPZ maintenance would not occur.

3.10.4.20 Alternative D: Effects on Indicator 1: Soil Productivity / Measure 2 — Soil Porosity

Direct, Indirect, and Cumulative Effects. These effects would be the same as under alternative B (proposed action).

3.10.4.21 Alternative D: Effects on Indicator 1: Soil Productivity / Measure 3 — Organic Matter

Direct Effects. The effects would be similar to alternative B, except that organic matter contribution from herbicide-killed vegetation would be minimal because herbicide use for DFPZ maintenance would not occur.

Indirect Effects. Effects would be similar to alternative B, except that organic matter contribution from herbicide-killed vegetation would be minimal because herbicide use for DFPZ maintenance would not occur.

Cumulative Effects. Effects would be similar to alternative B. There may be some difference in the quantity and distribution of nitrogen contributions from treated vegetation because herbicide use for DFPZ maintenance would not occur.

3.10.4.22 Alternative D: Effects on Indicator 3: Soil Buffering Capacity

Direct Effects. Herbicide application is not expected to have any detrimental direct effects on soil buffering capacity.

Indirect Effects. Effects would be similar to alternative B, but with a reduction in any potential changes to soil microbial community balance because herbicide use for DFPZ maintenance would not occur.

Cumulative Effects. Effects would be similar to alternative B, but minimal changes in the composition and balance of microbial soil communities are likely because herbicide use for DFPZ maintenance would not occur.

3.10.4.23 Alternative D: Effects on Measure 1 — Herbicides and Soil Quality

Direct Effects. Effects would be similar to alternative B, but any herbaceous ground cover loss would be minimal because herbicide use for DFPZ maintenance would occur.

Indirect Effects. Effects would be similar to alternative B, but herbicide-killed vegetation contributions to ground cover would be minimal because herbicide use for DFPZ maintenance would occur.

Cumulative Effects. Effects would be similar to alternative B, but herbicide-killed vegetation contributions to EHR reduction would be minimal because herbicide use for DFPZ maintenance would not occur.

3.10.4.24 Alternative E: Effects on Indicator 1: Soil Productivity / Measure 1 — Soil Cover

Direct Effects. Direct effects would be the same as alternative B, with a slight reduction in herbaceous ground cover loss because noxious weed control with herbicides would not occur.

Indirect Effects. Indirect effects would be the same as alternative B, with a slight reduction in herbicide-killed vegetation contributions to ground cover because noxious weed control with herbicides would not occur.

Cumulative Effects. Cumulative effects would be the same as alternative B, with a slight reduction in herbicide-killed vegetation contributions to EHR reduction because noxious weed control with herbicides would not occur.

3.10.4.25 Alternative E: Effects on Measure 2 — Soil Porosity

Direct, Indirect, and Cumulative Effects. Proposed project effects from alternative E would be the same as alternative B (proposed action).

3.10.4.26 Alternative E: Effects on Measure 3 — Organic Matter

Direct Effects. Herbicide application would have no detrimental direct effects on soil organic matter. Other effects would be similar to alternative B (proposed action).

Indirect Effects. Indirect effects would be the same as alternative B, with a slight reduction in organic matter contribution from herbicide-killed vegetation because noxious weed control with herbicides would not occur.

Cumulative Effects. Cumulative effects would be the same as alternative B. There may be a minor change in the quantity and distribution of nitrogen contributions from treated vegetation because noxious weed control with herbicides would not occur.

3.10.4.27 Alternative E: Effects on Indicator 3 — Soil Buffering Capacity

Direct Effects. Herbicide application is not expected to have any detrimental direct effects on soil buffering capacity.

Indirect Effects. Indirect effects would be the same as alternative B, with a slight reduction in any potential changes to soil microbial community balance because noxious weed control with herbicides would not occur.

Cumulative Effects. Cumulative effects would be the same as alternative B, except noxious weed control with herbicides would not occur, and there would be no potential for cumulative effects from successive annual applications of triclopyr.

3.10.4.28 Alternative F: Effects on All Indicators

Direct, Indirect, and Cumulative Effects. The effects of alternative F would be similar to alternative B (proposed action). Proposed DFPZ and individual tree selection treatments would not change. Due to the small reduction of proposed group selection treatments and the locally small area and scattered distribution of group selection treatments, the overall reduction in soil productivity and

soil buffering capacity would be low. The potential for local effects would be reduced through use of the standards, guidelines, mitigation measures, and BMPs listed in the "Slapjack Soils Report."

Herbicides effects would be the same as alternative B.

3.10.4.29 Alternative G: Effects on All Indicators

Direct, Indirect, and Cumulative Effects. The effects from DFPZ, group selection, and individual tree selection treatments would be the same as alternative F.

Herbicides are not proposed for use under alternative G, so there would be no direct, indirect, or cumulative effects.

3.10.5 Past, Present, and Reasonably Foreseeable Future Actions

The proposed DFPZ treatments for the Slapjack Project would eventually be connected to other DFPZ projects currently being implemented. A future project includes a roadside noxious weed risk assessment. There are several timber harvest plans on private lands within the Slapjack Project boundary. A list of past and future activities is included in "Hydrology Report."

3.10.6 Summary of Cumulative Effects

3.10.6.1 Indicator 1: Soil Productivity

Measure 1 – Soil Cover. Cumulative effects include changes in water movement through soil, uniform slope length, quantity and quality of ground cover, and distribution of soil cover.

With alternative A, existing conditions would persist under prevailing processes. However, high fuel loading conditions present a high risk of catastrophic wildfire, which would cause a detrimental loss of soil cover and resulting negative effects on soil productivity, including accelerated soil erosion. Group selection and individual tree selection treatments are designed to promote the HFQLG Act desired condition of uneven-aged fire-resilient stands, while maintaining a healthy forest. Also, the improvements described for the action alternatives would not occur under alternative A.

The proposed DFPZ treatment unit 5 is below the minimum standards set forth by the Forest Plan. Unit 5 is a proposed mastication unit, and through the mastication process proposed in the action alternatives, soil cover would increase, although depending on the equipment used to masticate, ground contact of newly distributed material may not be optimum, and distribution may be patchy. DFPZ treatment unit 5 also contains group selection treatment units. The Forest Plan requires a minimum effective ground cover of 50 percent in this unit. Soil cover in all other proposed treatment units exceeds the minimum standards. Overall, proposed treatments would help reach the desired condition of uneven-aged fire-resilient stands, while maintaining a healthy forest. During and after project implementation, soil cover would meet or exceed standards through use of the standards, guidelines, mitigation measures, and BMPs listed in the "Soils Report" on file in the project record.

In alternatives B, D, and E, soil cover in general would likely increase as a consequence of herbicide application. Some short-term reduction in the herbaceous component of ground cover may

occur; this is a minor component of overall ground cover in most areas. Vegetation killed by herbicides would remain on site and provide ground cover to prevent soil erosion for the first few years following treatment, and would subsequently become incorporated into the soil organic matter constituent. Material resting directly on the ground surface would generally provide more effective erosion protection than canopy cover. Dead vegetation resulting from herbicide application would become incorporated in the ground surface layer more rapidly and may assist in providing ground cover in areas where canopy and soil cover may be depleted by mechanical or thermal treatments.

The only difference between alternatives B and C is that no herbicide use is proposed in alternative C, and no environmental effects associated with herbicide use would occur, including any that might affect soil quality indicators.

The effects of alternative F would be similar to alternative B because DFPZ and individual tree selection treatments do not change across all of the action alternatives. Due to the small reduction of proposed group selection treatments, and the locally small area and scattered distribution of group selection treatments, the overall reduction in soil productivity and soil buffering capacity would be low. The potential for local effects would be reduced with use of the standards, guidelines, mitigation measures, and BMPs listed in the “Soils Report” on file. Alternative G would have the same effects as F, except there would be no herbicides used.

Measure 2 – Soil Porosity. With alternative A, existing conditions would persist under prevailing processes, and no new compaction would occur because the improvements described in all action alternatives would not occur.

The definition of cumulative effects includes detrimental soil compaction. There are several proposed treatment units that exceed the maximum standard for compaction. In all treatment units, existing landings and skid trails would be used if possible, and low-ground-pressure mechanical equipment would be used. New landings and approaches would be subsoiled to a distance of 200 feet from the landing because this is the area where compaction is most likely to occur. When properly designed and implemented, subsoiling can be effective in reducing compaction (Kolka and Smidt 2004). Any additional compaction in excess of the allowable standards that may occur in treatment units would be mitigated by applying the standards, guidelines, mitigation measures, and BMPs listed in the “Slapjack Soils Report.” There would be no difference in effects between alternatives B, C, D, and E for mechanical treatment. Herbicide application would not affect soil porosity.

Due to the locally small area and scattered distribution of group selection units, there would be no significant difference between alternatives B, F, and G.

Measure 3 – Organic Matter. The existing conditions under alternative A would persist under prevailing processes. The existing high fuel loading conditions would continue to present a high risk of catastrophic wildfire, which would cause a detrimental loss of organic matter and soil nutrients. Also, the improvements proposed for all action alternatives would not occur.

The definition of cumulative effects includes the loss of organic matter needed for nutrient cycling. For all alternatives, mastication would increase the amount of surface organic matter and would result in minimal soil displacement. Mechanized thinning, biomass removal, and individual tree selection in treatment units may reduce the amount of total nitrogen available to vegetation,

particularly on areas with low site potential. However, this reduction would be minimal compared to the extensive reduction that would occur during a stand-replacing fire. Underburning and pile burning produce many of the same impacts that are associated with wildfires, but the effects of prescribed burning are generally less extreme. This is because ignition can be limited to periods when soil moisture is sufficiently high, and weather conditions are within a range conducive to preventing complete consumption of the duff, litter, and large woody debris and to minimizing hydrophobic soil development. As group selection treatment units regenerate, surface organic matter would increase with needle drop and litter fall. The loss of organic matter would be minimized in all units for alternatives through use of the standards, guidelines, mitigation measures, and BMPs listed in the "Slapjack Soils Report." Some of the treatments would likely increase in organic matter.

Herbicide application would have no detrimental cumulative effects on soil organic matter. Any short-term loss of nitrogen availability from the death of nitrogen-fixing plants, such as broom or *Ceanothus* species, would be replaced by the incorporation of dead vegetation in the soil and the greater availability of solar energy for plant material decomposition. Plant material that is left on site after herbicide application would become available for organic matter constituents, as opposed to being removed from the ecosystem, if biomass treatments are performed.

3.10.6.2 Indicator 2 — Hydrologic Function

Changes in hydrologic function, measured with respect to changes in soil porosity, are summarized in terms of changes in overall landscape disturbance. These changes are described and quantified by application of the Equivalent Roaded Area (ERA) model for calculating risk of cumulative watershed effects. The model and its results are described in the "Hydrology" section (3.8).

Soil disturbance, which can alter hydrologic function and change ERA values, would likely be minimal as a result of herbicide application. The loss of live vegetation and root strength would probably be compensated by the addition of ground cover and protective soil organic matter. Herbicide application is not considered a measurable factor for the ERA calculations.

3.10.6.3 Indicator 3 — Soil Buffering Capacity

The soil buffering capacity of soils in the project area is not known, but it is unlikely that it would be changed by proposed management activities in the Slapjack Project area.

3.11 Transportation System

3.11.1 Regulatory Framework

The roads in the Slapjack Project area that are proposed for decommissioning or closure are causing significant resource impacts. These roads are not needed because other roads are available to provide the necessary access to implement group selection harvests and DFPZ construction as directed in the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) (Section 401 (b) (1), (d) (1), and (d) (2)) and the Sierra Nevada Forest Plan Amendment. The Forest Service is directed to reduce impacts of the transportation system on resources by implementing road relocation or improvements as part of the *Riparian Management Plan* (see appendix R of the HFQLG final environmental impact statement) as required by the HFQLG Act (Section 401 (b) (1), (c) (2) (B), and (d) (4)).

3.11.2 Methodology for Assessing Impacts on the Transportation System

3.11.2.1 Scope of the Analysis

The proposed Slapjack Project area is located in Butte and Yuba Counties, California, within the Feather River Ranger District of the Plumas National Forest. The project area would comprise approximately 34,725 acres of public and private land and would generally be situated between Lake Oroville to Dobbins on the west, the North Yuba River to Wambo Bar on the east, and from Barton Hill to the town of Feather Falls to the north. The area ranges in elevation from approximately 1,300 to 3,800 feet above mean sea level. The project area includes portions of Management Areas 10 (Feather Falls) and 11 (Challenge) as defined in the 1988 *Plumas National Forest Land and Resource Management Plan*.

3.11.2.2 Analysis Methods

The transportation system for the Slapjack Project area was evaluated through a roads analysis. The following needs were identified based on that analysis and known access needs for proposed DFPZ and group selection treatments:

- Road reconstruction and maintenance are needed to bring existing classified roads into compliance with current maintenance standards and to provide access to the DFPZ and group selection treatment areas. Reconstruction and road maintenance are also necessary to reduce erosion and sedimentation and to provide for public safety.
- Road decommissioning is needed to reduce erosion, sedimentation, and soil compaction and to reduce road density and wildlife impacts.
- Closure of spur roads is needed to reduce erosion, sedimentation, soil compaction, and impacts to wildlife.
- Culvert replacement, removal, or upgrade is needed to improve watershed connectivity.

- Temporary road construction is needed to access group selection and DFPZ units where existing road access is absent.
- New classified road construction is needed to provide access to one treatment area where existing road access is poor.
- Harvest landing construction and reconstruction are needed to facilitate removal of wood products.

3.11.2.3 Design Criteria (Prescriptions)

The purpose of the National Forest road system is to provide suitable conditions for passage of all Forest Service and cooperator emergency vehicles and to meet resource management and public access needs. The road system and improvements should minimize adverse effects on watershed and wildlife values. Roads near streams or in riparian zones have the greatest probability of intercepting, concentrating, and diverting flows from natural flow paths and should therefore be minimized where feasible. Road-stream crossings have the potential for failing and diverting water and should therefore be minimized where feasible. Roads can reduce and fragment wildlife habitat, but they can also provide access for habitat protection from wildfire and treatments designed to improve habitat quality. Roads should be minimized where adverse effects outweigh benefits to wildlife.

To protect watershed resources, the desired conditions for roads that would be retained and improved (through for road construction, reconstruction, or relocation) include the following:

- Accommodation of the 100-year flood at stream crossings, including streamflow, bedload, and debris;
- No diversion of streamflow along roads in the event of crossing failure;
- No diversion of natural hydrologic flow paths at stream crossings, including paths of streamflow, surface runoff, and groundwater; and
- No roads located in wetlands and meadows and minimization of road effects on natural flow patterns in wetlands and meadows.

3.11.3 Affected Environment (Existing Conditions)

Two major arterial routes access the project area: the LaPorte Road running southwest to northeast and the Challenge Cut-off Road-Oregon Hill Road running north to south. The Slapjack Project area is considered to have a fully developed arterial and collector road system. Soper Wheeler Industries and Chy Industries are major private landholders in the area. The Plumas National Forest has entered into cooperative road cost-share agreements with Soper Wheeler Industries. These agreements were made in an effort to share the cost of National Forest road construction, reconstruction, and maintenance.

There are a total of approximately 165.7 miles of existing classified roads in the project area. In addition to the existing classified roads, there are numerous unclassified roads, abandoned roads, and

skid trails in the project area. There are 3.6 miles of Level 1 roads assigned to intermittent service. There are 79.5 miles of Level 2 roads assigned where management direction requires the road to be open for limited passage of traffic. There are 55.7 miles of Level 3 roads where management direction requires the road to be open and maintained for safe travel by a prudent driver in a passenger car. There are 26.9 miles of Levels 4 and 5 roads where management direction requires the road to provide a moderate to high degree of user comfort and convenience at moderate travel speeds.

3.11.4 Environmental Consequences

3.11.4.1 Alternative A

Direct Effects. Reconstruction of classified roads would not occur, and impacts on watershed and user safety would continue on roads needing reconstruction. There would be no new direct impact on road surfaces from log haul activity. There would be no increase in hazards to driver safety from logging traffic. Classified roads, unclassified roads, and abandoned skid trails would not be decommissioned and would continue to cause resource damage. Normal routine maintenance would occur based on current maintenance levels.

Road would continue to negatively impact watersheds and public safety because no roads would be reconstructed, decommissioned, or closed. Fire access would be restricted because some roads would remain, or become, impassable.

Indirect Effects. No rights-of-way would be needed for the normal road maintenance completed in this area.

Cumulative Effects. No reduction in classified or unclassified roads would occur during normal road maintenance completed in this area.

3.11.4.2 All Action Alternatives

Direct Effects. Approximately 7 miles of existing classified road could potentially be closed with barriers upon project completion (see table 3-37). In addition to the information contained in the tables in this section, figure A-3 in appendix A contains three maps that depict the proposed transportation system changes.

Alternative A (No Action)
- No treatments would be implemented.

Alternative B (Proposed Action)
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres), mechanical and manual methods, and prescribed burning

Alternative C
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Alternative D
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds with herbicides (up to 31 acres)

Alternative E
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds without herbicides

Alternative F
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres)

Alternative G
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Table 3-37. Potential road closures under the Slapjack Project.

Slapjack Road Closure Opportunities					
Road No.	**Classified**	**Location Township/Range Section**	**Classified Miles**	**Dead End**	**Loop**
1	18N09	18/7 S14	0.7	Yes	
2	18N10	18/7 S14	0.6	Yes	
3	19N04A	19/7 S20	0.3	Yes	
4	19N04C	19/7 S28	0.4	Yes	
5	19N05	19/7 S34	0.7		Yes
6	19N08	19/7 S30	0.6	Yes	
7	19N10	19/7 S32	0.6		Yes
8	19N21	19/6 S9	0.3	Yes	
9	19N36	19/6 S8	0.8	Yes	
10	19N48	19/6 S3	0.7	Yes	
11	19N49	19/7 S32	0.3		Yes
12	19N52	19/6 S5	0.6	Yes	
13	20N67	20/6 S15	0.7	Yes	
Classified Road Mileage			**7.3**		
Miles – Number of Dead-end Roads			**5.7**	**10**	
Miles – Number of Loop Roads			**1.6**	**3**	
Total			**7.3**		

The Slapjack Project proposes road decommissioning (see table 3-38) to reduce impacts on watersheds and wildlife, while allowing adequate access for fire suppression, forest management, and public use. Approximately 19 miles of existing classified or unclassified road would be decommissioned during project implementation. Roads slated for decommissioning are not needed for fire access or resource management and are causing watershed and wildlife impacts. Proposed road decommissioning, closure, or reconstruction would contribute to watershed restoration, including meadow enhancement, fish passage, and stream stabilization. There are many unsurfaced roads in the Slapjack Project area that are contributing to degradation of water quality and aquatic habitat. This low-elevation area is accessible for year-round use and is susceptible to rutting during wet weather use. For those roads that would be decommissioned and/or closed, the roadbed would be stabilized or removed, and culverts would be pulled and stream crossings stabilized.

Table 3-38. Slapjack Project classified and unclassified road decommissioning opportunities.

Road Number	Location Township/Range Section	Classified Miles	Unclassified Miles	Dead-end Spur	Loop Road
20N67	20/6 S15	0.36		Yes	
20N53	20/6 S26	0.26		Yes	
20N24B	19/6 S8	0.86		Yes	
19N19A	19/6 S4	0.47		Yes	
19N40	19/6 S4	0.47			Yes
19N64	19/6 S2/3	0.28		Yes	
19N64A	19/6 S2	0.09		Yes	
U1367	19/7 S1		0.44		Yes
20N04D	19/7 S1	0.65		Yes	
20N04B	19/8 S5	0.69			
20N82	19/8 S4	0.31		Yes	
U1239	19/6 S9		0.20	Yes	
U1366	19/7 S8		0.15	Yes	
U1429	19/7 S11		0.28	Yes	
19N44	19/7 S17	0.56		Yes	
U1424	19/7 S16		0.51	Yes	
U----	19/7 S20		0.14	Yes	
U1464	19/7 S21		0.56		Yes
19N16B	19/7 S21	0.55		Yes	
19N53A	19/7 S21	0.21			Yes
U----	19/7 S30		0.20	Yes	
U----	19/7 S30		0.23	Yes	
U----	19/7 S30		0.19	Yes	
U1483	19/7 S28		0.31		Yes
U1471	19/7 S27/28		0.74	Yes	
U1492	19/7 S27		0.15	Yes	
U1497	19/7 S27/34		0.27	Yes	
U1496	19/7 S33		0.45	Yes	
19N38	19/7 S33	0.44			Yes
19N00D	19/7 S34	0.44		Yes	
19N00	18/7 S2	0.30			
19N26	18/7 S2	0.35		Yes	
19N28	18/7 S2	0.51		Yes	
18N08	18/7 S15	0.57			Yes
18N07	18/7 S15	0.49			Yes
18N09A	18/7 S14	0.09		Yes	
18N01	18/7 S22	0.32			Yes
18N11	18/7 S22	0.40			Yes
18N11B	18/7 S22	0.20		Yes	
U1590	18/7 S22		0.28	Yes	
18N16	18/7 S26	0.15		Yes	
18N14B	18/7 S26	0.12		Yes	
18N14	18/7 S26	0.55		Yes	

Table 3-38. Slapjack Project classified and unclassified road decommissioning opportunities (continued).

Road Number	Location Township/Range Section	Classified Miles	Unclassified Miles	Dead-end Spur	Loop Road
19N16	18/7 S26	0.65			Yes
20N25	19/7 S1	0.50			
19N50	19/6 S7	0.49			Yes
20N88	19/8 S5	0.08		Yes	
U1244	19/6 S8		1.08	Yes	
U----			0.28	Yes	
U----			0.26	Yes	
Classified Road Mileage		**12.41**			
Unclassified Road Mileage			**6.72**		
Total Classified and Unclassified		**19.13**			

Through project planning, the public was given the opportunity to participate and comment on proposed road closures and decommissioning. The Plumas National Forest is currently undergoing an off-highway vehicle (OHV) route inventory and designation process. Roads proposed for decommissioning or closure in this project would not be closed until the OHV process has been completed, unless the following criteria apply:

- Dead-end spurs or routes that show no evidence of OHV use, which are also contributing to resource damage.
- User-created routes in areas that are already closed by existing Forest Orders.
- Routes that are creating unacceptable resource damage, to the extent that a delay in their closure would result in unacceptable and irretrievable impacts on the resource.

The Interdisciplinary Team evaluated the roads proposed for decommissioning against these three criteria. Three road segments (19N00, 20N04B, and 20N25) totaling 1.5 miles were found to meet the criteria. Because of the extent of resource damage, these roads are proposed for decommissioning prior to the completion of the OHV route inventory and designation process. These roads are listed above in table 3-38 and shown on figures A-3a through A-3c in appendix A.

Approximately 22 miles of existing classified roads would be reconstructed prior to project use (see table 3-39). Reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts where needed.

Approximately 9 miles of temporary roads would be constructed then decommissioned after use.

Existing harvest landings in group selection units and DFPZs would be reconstructed, and new ones would be constructed.

Table 3-39. Slapjack Project proposed road reconstruction.

Road Number	Miles	Maintenance Level	Road Number	Miles	Maintenance Level
18N01A	0.36		19N29	0.52	2
18N01E	1.00		19N38	0.10	2
18N01W	0.91		19N42	0.39	2
18N014	0.83		19N43	0.86	2
19N00	0.32		19N46	0.88	2
19N09	2.00	2	19N52	0.34	2
19N16N	1.27	2	19N53	1.10	2
19N16S	1.67	2	19N57	0.40	2
19N17	2.57	2	20N04	3.05	2
19N18	0.32	2	20N67	0.34	2
19N19	1.67	2	20N67A	0.53	2
Total miles 21.5					

The road improvements proposed in the action alternatives would provide access needed for the DFPZ and group selection units. The proposed improvements would also provide access needed for fire suppression and fuels management to reduce the chance of catastrophic fire through intensive vegetation manipulation at a lower cost because of the improved access. The action alternatives would generate traffic from log trucks, chip vans, and support vehicles. Traffic-related safety problems would be mitigated with standard contract requirements.

Indirect Effects. There are eight roads on private property that would be needed to access portions of the project area (see table 3-40). Two would be obtained through a cost-share agreement, and the other six may be obtained through easements or license agreements. Contractors would need to obtain a written waiver from Yuba County in order to use Yuba County Road 129 for loads greater than the posted 22-ton load limit.

Table 3-40. Slapjack Project right-of-way needs.

Road Number	Location Township/Range Section	Miles	Access Requirements	Owners
U1463	19/7 S13	0.3	Access to group selection unit 542	Siller Bros
U1209	19/6 S3	0.1	Access to north end of DFPZ unit 61 (Heritage precludes alternate access)	Dave Dorn
20N14	20/7-B S36-31	0.2	Include with cost-share supplement Access to Big Hill/Weed point units	Soper Wheeler
Temporary	18/7/ S3	0.0	Access to DFPZ unit 12 (100 feet)	Max Doner
U1544	18/7 S11	1.2	Access to DFPZ units 11 and 525	Chy Corp
Private road	18/7 S33	0.7	Access to DFPZ units 84 and 284	Chy Corp
Temporary	19/7 S20	0.1	Access to DFPZ unit 229	Thomas Fawcett
20N22 20N53	20/6 S14.23	13	Include with cost-share supplement Access to DFPZ unit 78	SPI
Classified Road Mileage		**1.5**		
Unclassified Road Mileage			**2.4**	

Cumulative Effects. A net reduction of approximately 19 miles of classified and unclassified roads in alternatives B through G would occur after proposed road decommissioning is completed. Once decommissioned, roads would be available for reforestation and conversion back to a natural landscape.

3.11.5 Past, Present, and Reasonably Foreseeable Future Actions

Other than ongoing routine road maintenance, past, present, and future projects in the vicinity of the Slapjack Project have not impacted nor are they expected to impact the transportation system in the project area.

3.12 Vegetation

3.12.1 Introduction

The Forest Service proposes to construct DFPZs to reduce fuel hazards, regenerate fire-resilient species using an uneven-aged management strategy (group selection treatments), area thinning (individual tree selection), and perform associated road system improvement work on approximately 5,800 acres of forested federal land east of Lake Oroville and west of the Yuba River, California. The project would be part of the Herger-Feinstein Quincy Library Group (HFQLG) Pilot Project authorized in federal law (the *Herger-Feinstein Quincy Library Group Forest Recovery Act*).

3.12.2 Regulatory Framework

The *National Forest Management Act of 1976* (see appendix G of this EIS for the findings) provides specific management requirements that must be addressed when implementing timber harvest activities on National Forest System lands. The regulations include specific guidelines designed to ensure that timber will be harvested from National Forest System lands only where

- there is assurance that such lands can be adequately restocked within five years after harvest;
- soil, slope, or other watershed conditions will not be irreversibly damaged;
- protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat; and
- the harvesting system to be used is not selected primarily because it will give the greatest dollar return or the greatest unit output of timber (16 USC 1604 (g)(3)(E)).

The *National Forest Management Act* findings for the Slapjack Project are discussed in appendix H of this document and in section 5 of the “Slapjack Project Silviculture Report” (on file at the Feather River Ranger District).

The Slapjack Project is designed to fulfill the management direction specified in the 1988 *Plumas National Forest Land and Resource Management Pla*n (often referred to as the “Forest Plan”), as amended by the *Herger-Feinstein Quincy Library Group Forest Recovery Act* Record of Decision of 1999 and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA). The standards and guidelines for fuels and vegetation management activities for the Slapjack Project area are shown in table 2 of the SNFPA Record of Decision. Table 2 includes direction for designing and implementing fuel and vegetation management activities within each of the various land allocations applied to the HFQLG Pilot Project.

Table 3-41 below summarizes the land allocations for DFPZ and group selection units analyzed for treatment. A complete list of land allocations by treatment unit is included in appendix F, which is consistent with table 2 of the SNFPA Record of Decision, wherein no timber harvesting or DFPZ construction can be proposed within lands designated as Off Base and Deferred, California spotted owl Protected Activity Centers, or Spotted Owl Habitat Areas. Within late-successional old-growth rank 4 and 5 stands, only DFPZ construction is proposed. Consistent with the direction provided by the 1988 Forest Plan, group and individual tree selection would not be conducted in the Challenge Experimental Forest. The Rank 4 and 5 stands are consistent with the standards and guidelines in table 2 of the SNFPA 2004 Record of Decision. The DFPZs have been designed to avoid old-forest stands (California Wildlife Habitat Relationship [CWHR] size classes 5M, 5D, and 6) within this allocation.

Table 3-41. Land allocations for proposed treatment units.

Land Allocation	Acres in DFPZ Units	Acres In Group Selection Units	Acres in Individual Tree Selection Unit
Spotted Owl Protected Activity Center[a]	0	0	0
Late-succession old-growth ranks 4 and 5[a, b]	363	0	0
Challenge Experimental Forest	1,612	0	0
Lands available for vegetation and fuels Management	2,444	219	148

Notes:

a. As listed in table 2 – standards and guidelines applicable to the HFQLG Pilot Project area for the life of the Pilot Project. Table 2 is in the SNFPA 2004 Record of Decision.

b. Late-successional old-growth stages of forest trees, as defined by the Sierra Nevada Ecosystem Project (volume II, appendix 21.1).

3.12.3 Methodology for Assessing Impacts on Vegetation

3.12.3.1 Scope of the Analysis

The analysis for the existing conditions and direct and indirect environmental effects on vegetation resources is limited to the Slapjack Project area. Because vegetation management activities have localized effects on vegetation attributes such as canopy cover, tree density, and tree size, which are generally confined to the treated area, the geographic boundary for direct, indirect, and cumulative effects analyses of vegetation resources is limited to past, present, and reasonably foreseeable future actions within the Slapjack Project area. In addition, the *Plumas National Forest Land and Resource Management Plan*, appendix E, requires that habitat types and seral stages be tracked and monitored by management areas. Therefore, the analysis area for seral stage diversity is bounded by Management Areas 10 (Feather Falls) and 11 (Challenge) in which the Slapjack Project is located. A management area is a contiguous unit of land with varying physical and biological character and management needs.

The time frame for vegetation cumulative effects varies, depending on if the effects of past actions on vegetation attributes are still evident in the most recent aerial photographs or if the actions occurred after the aerial photographs were taken. For the Slapjack Project, the vegetation analysis of past actions implemented before the most recent aerial photographs (1997) focused on past natural (fire, insect, and disease) and human disturbances (logging, thinning) that affected vegetation attributes (such as canopy cover, size class, and vegetation types) that were still evident in the 1997

aerial photographs. Effects of these past actions are described qualitatively rather than quantitatively. For the Slapjack Project, cumulative effects of past projects were taken into account for the Geographic Information System (GIS) analysis of timber types, which was based on year 1997 aerial photograph interpretation. Aerial photograph interpretation analyzed all size classes (saplings, poles, small trees.) and canopy cover (open, sparse, moderate, and dense) for each of the timber or vegetation types within the coverage area. Past activities are listed in the "Silviculture Report." There are no reasonably foreseeable projects in the Slapjack Project analysis area.

Past, present, and reasonably foreseeable future actions that have occurred after the most recent aerial photograph interpretation and vegetation analysis are analyzed quantitatively in order to adequately estimate cumulative effects of the actions on vegetation attributes.

3.12.3.2 Analysis Methods

DFPZ Areas and Individual Tree Selection Areas. Field inventories were conducted to measure attributes of existing vegetation in order to ensure that silvicultural prescriptions are consistent with the amended Forest Plan. Data were used to determine site quality, timber volume, basal area, number of trees per acre, tree growth, species present, and tree condition. The extent of each inventory was based on the degree to which proposed activities would reduce canopy closure or basal area. Extensive inventories were conducted only in units proposed for thinning, where proposed activities would be designed to bring canopy cover and basal area closer to Forest Plan standards and guidelines. Detailed vegetation inventories were not conducted in units proposed for underburn, mastication, or other nonharvest treatments.

Thinning units were inventoried using the current Forest Inventory and Analysis User's Guide for the Pacific Southwest Region. The Forest Inventory and Analysis system is used to collect data from a series of random points located within a number of stands with a possible need for treatment. Each sample point consists of five nested plots: (1) A variable radius prism plot to gather data on large (greater than 4.9 inches dbh) live trees; (2) a 1/100-acre fixed-radius plot for live saplings and seedlings; (3) a 1/2-acre fixed-radius plot for understory vegetation (brush species); (4) a 1/4-acre rectangular plot for large (greater than 19.9 inches dbh) snags, and (5) a 1/8-acre plot for small snags and large down logs. The following data are recorded for each live tree sampled in variable radius prism plots: species, diameter, crown position, live crown ratio, dwarf mistletoe infestation, and defect. In each stand, height and age measurements are recorded.

In the four other plots, information is collected on the number of seedlings present, the amount and height of understory brush, and the size and condition of standing snags and large down logs. The field data are loaded into the Forest Inventory and Analysis program and used as a database to generate various reports. Reports generated for each Slapjack Project treatment unit included numbers of trees per acre, volume per acre, basal area per acre, and so forth.

The Forest Inventory and Analysis data were also loaded into the Forest Vegetation Simulator, a forest growth model that predicts forest stand development. This model was used to predict stand development after alternative treatments.

Additional analyses included aerial photo interpretation and Plumas National Forest "e-veg" timber type coverages (based on year 1997 aerial photographs) in the Geographic Information System (GIS), which were used to determine timber strata, size class, and densities. The GIS coverages were also used to determine land classification and allocation.

The topography, slope, and access of a unit were used to determine the most appropriate harvest system. For all proposed treatment units in the Slapjack Project, only ground-based or cable-harvest systems would be used. Silvicultural prescriptions were based on a desired future stand condition and used stand exam data, Forest Vegetation Simulator projections, aerial photograph interpretation, and field review.

Group Selection Layout. The HFQLG Act includes expectations for treating 0.57 percent of the Pilot Project acreage annually using group selection methods. Based on that expectation, approximately 8,700 acres of the Pilot Project would be treated annually through group selection (HFQLG final EIS, appendix E). This rate of group selection harvests represents an average rotation age of 175 years. The intent is to vary the rate according to site capability, managing poorer sites for 200-year-old trees and more productive sites for 150-year-old trees. Table 3-42 displays acres available for group selection harvest in the Slapjack Project area and watersheds on an annual 10-year and 20-year reentry interval. Another environmental analysis would be completed before reentry in 10 or 20 years.

Table 3-42. Determination of group selection acres in the Slapjack Project area and watersheds based on HFQLG Act annual expectations (0.57 percent of Pilot Project acreage).

Watersheds – Slapjack Project		Total Group Selection Acres	Annual Treatment[a] (acres)	10-Year Re-Entry[b] (acres)	20-Year Re-Entry[c] (acres)
Acres of National Forest System lands in watersheds	Ponderosa Reservoir	8,866	—	—	—
	Frey Creek	3,282	—	—	—
	McCabe Creek	469	—	—	—
	New Bullard's Bar Reservoir	16,622	—	—	—
	Dobbins Creek	417	—	—	—
	Lower Dry Creek	3,966	—	—	—
	Total acres in project watersheds	**33,622**	**192**	**1,916**	**3,833**
Slapjack Project Area		**Total Group Selection Acres**	**Annual Treatment[a] (acres)**	**10-Year Re-Entry[b] (acres)**	**20-Year Re-Entry[c] (acres)**
Net National Forest System lands in area		27,739	—	—	—
Not available for group selection	Challenge Experimental Forest	4,126	—	—	—
Unsuitable	PACs and SOHAs[d]	3,726	—	—	—
	LSOG[d] 4 and 5	8,606	—	—	—

Table 3-42. Determination of group selection acres in the Slapjack Project area and watersheds based on HFQLG Act annual expectations (0.57 percent of Pilot Project acreage) (continued).

Slapjack Project Area		Total Group Selection Acres	Annual Treatment[a] (acres)	10-Year Re-Entry[b] (acres)	20-Year Re-Entry[c] (acres)
Not capable	Urban, Barron, Water, & Grass	506	—	—	—
Net capable and suitable		10,775	61	614	1,228
Other areas eliminated from group selections					
	Size Class 0-2	2,487	—	—	—
	Shrubfields	187	—	—	—
	Hardwoods	3,731	—	—	—
	Cultural resources, TES[d] plant species, and uneconomical		—	—	—
Possible acres available for group selection	CWHR[d] size 5 stand acres in DFPZ	894	5	51	102
	CWHR size 4 stand acres in DFPZ[d]	1,466	8	84	167
	Stand acres outside DFPZ	1,173	7	67	133
	Total possible available acres	**3,533**	**20**	**201**	**402**

Notes:

a. Calculated by multiplying total watershed acres or project area × 0.0057 (accomplishment yearly expectation rate).

b. Calculated by multiplying 2,380 (total possible available acres) × 0.0057 × 10 (years of the treatment cycle).

c. Same as for the 10-year cycle except using 20 years.

d. PAC = Protected Activity Center; SOHA = Spotted Owl Habitat Area; LSOG = late-successional old-growth; TEPS = Threatened, Endangered, and Sensitive; CWHR = California Wildlife Habitat Relationship

As shown above in table 3-42, there are approximately 3,533 acres available for group selection in the Slapjack Project area. However, this total does not take certain land allocations into account, meaning that implementation of group selection may not be possible on all 3,533 acres. Group selection harvest units would not be located in

- HFQLG Off Base and Deferred Lands
- Protected Activity Centers for the California spotted owl and northern goshawk
- Spotted Owl Habitat Areas
- recreation sites
- Challenge Experimental Forest
- California Wildlife Habitat Relationship size class 2 stands

- Riparian Habitat Conservation Areas
- rocky outcrops
- shrubfields
- cultural resources
- Threatened, Endangered, or Sensitive plant populations (flag and avoid)
- late-successional old-growth size ranks 4 and 5

The SNFPA 2004 Record of Decision includes additional requirements that may affect the number of groups implemented under the Slapjack Project. The standards and guidelines in table 2 (SNFPA 2004 Record of Decision) specify that maintaining specific basal area and canopy cover requirements for CWHR 5M, 5D, and 6 size class stands in DFPZs and area thinning (individual tree selection) treatment units would have the greatest effect on group layout.

Supplemental criteria that may be considered during the layout of group selection units are listed below.

- Harvest no more than 20 percent of any individual stand or 2 acres, whichever is larger.
- Disperse groups throughout the stand.
- Leave enough space between groups to allow creation of future groups.
- Avoid placing groups in black oak areas where possible.
- Avoid placing groups in areas that contain more than 20 trees per acre of trees with a diameter at breast height of 30 inches.

3.12.3.3 Indicator Measures

Seven environmental measures, or indicators, were analyzed in this vegetation section: species composition, forest health, canopy cover, stand structure and tree size, basal area and tree density, harvest volume, and effectiveness of DFPZ maintenance treatments. There is a description of the existing condition for each indicator, followed by a summary of the direct, indirect, and cumulative effects of the alternatives.

3.12.3.4 Design Criteria

For alternatives B, C, D, E, F, and G (the action alternatives), effects are discussed in terms of the prescriptions proposed for each treatment type. Prescriptions with similar effects are grouped together for the purposes of this analysis. Group selection treatment units would be treated by harvest, site preparation, reforestation, and release. All four prescriptions are grouped together for this effects analysis because of the similarity of effects.

Prescriptions for DFPZ treatments are broken down into three groups for this effects analysis:

- Mechanical thinning and biomass removal
- Mastication and grapple piling
- Underburning and pile burning

The prescriptions for the various treatment types are detailed in chapter 2, section 2.3.2.1 of this document.

3.12.4 Affected Environment (Existing Conditions): Species Composition

Elevation in the project area ranges from 1,100 feet near Ponderosa Reservoir to 3,800 feet near Pike County Lookout and Big Hill. Elevation affects the forest types that are present. Forest types in the analysis area range from montane hardwood and Sierran mixed conifers-ponderosa pine at lower elevations, to Sierran mixed conifer-Douglas-fir at mid elevations (table 3-43).

Table 3-43. Description of forest types found in the Slapjack Project area.

Forest Type	Major Species	Other Species Present
Mixed conifer	Ponderosa pine (*Pinus ponderosa*) or Douglas-fir (*Pseudotsuga menziesii)*	Incense-cedar (*Caloocedrus decurrens*), white fir (*Abies concolor*), tanoak (*Lithocarpus densiflorus*), and sugar pine (*Pinus lambertiana*)
Ponderosa pine	Ponderosa pine	Incense-cedar, Douglas-fir, sugar pine, white fir, and tanoak
Montane hardwoods	Tanoak, madrone (*Arbutus menziesii*), and California black oak (*Quercus kelloggi*)	Ponderosa pine, incense cedar and scattered Douglas-fir, sugar pine, and white fir

As a result of past harvesting, there are fewer large (greater than 30 inches dbh) ponderosa pine, sugar pine, and Douglas-fir. Mortality of sugar pine from white pine blister rust (*Cronartium ribicola*) has also contributed to reduced numbers of these species, especially the smaller trees. Past disturbance has favored germination of new shrub, hardwood, and conifer seedlings and, along with fire exclusion, a higher density of small, mostly shade-tolerant trees (tanoak, incense-cedar, and white fir) in the understory.

The typical mixed conifer type includes shade-tolerant species (like incense-cedar, tanoak, and white fir) that can germinate and grow in the shade of the overstory trees. Without any disturbance, these shade-tolerant species can develop into multiple layers of vegetation or ladder fuels. When low-severity fires are allowed to burn through these stands at frequent intervals (every 5 to 15 years), shade-tolerant vegetation can be kept below the lower reaches of the overstory foliage, preventing the development of a fuel ladder.

3.12.5 Environmental Consequences: Species Composition

3.12.5.1 Alternative A (No Action)

Historically, stands in the Slapjack Project area had a higher component of shade-intolerant species such as ponderosa, Douglas-fir, and sugar pine in the overstory. Maintaining the existing stand structure would favor shade-tolerant species such as white fir, tanoak, and incense-cedar. There would be little opportunity for the naturally dominant pine species to reestablish and regenerate themselves, except what may occur through natural large-scale disturbance events such as wildfire.

Alternative A (No Action)
- No treatments would be implemented.

Alternative B (Proposed Action)
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres), mechanical and manual methods, and prescribed burning

Alternative C
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

Alternative D
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs without herbicides
- Control noxious weeds with herbicides (up to 31 acres)

Alternative E
- Construct DFPZs
- Implement group selection (219 acres)
- Implement individual tree selection (148 acres)
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds without herbicides

Alternative F
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs with herbicides (1,954 acres)
- Control noxious weeds with herbicides (up to 31 acres)

Alternative G
- Construct DFPZs
- Implement group selection (190 acres), except in watersheds over the Threshold of Concern
- Implement individual tree selection (148 acres); no proposed ITS units are located in watersheds over the Threshold of Concern
- Maintain DFPZs without herbicides
- Control noxious weeds without herbicides

3.12.5.2 All Action Alternatives: Direct and Indirect Effects of DFPZ Treatments

Mechanical Thinning and Biomass Removal. White fir, tanoak, and incense-cedar would be the primary species removed, but some ponderosa pine and Douglas-fir and a very limited number of sugar pine may also be removed. Preference for residual trees would be based on the relative shade intolerance of the species, forest health (insect and disease damage), and structure class (suppressed, intermediate, or codominant trees). As for tree species, ponderosa pine would be given primary preference, followed by black oak, sugar pine, Douglas-fir, incense-cedar, and white fir. Tanoak would only be left if needed to meet canopy cover standards.

Mastication. The thinning proposed under all action alternatives would favor the retention of under-represented conifers (sugar pine and Douglas-fir), as well as oaks in those plantations dominated by ponderosa pine. Thinning would also favor retention of the most vigorous individuals, rather than simply to achieve desired spacing. This would result in less homogenous (containing the same species) stands of trees than what currently exists. Mastication would be limited to trees less than 9 inches dbh and would only affect the species composition of understory trees.

Grapple Piling. Grapple piling would only be used in conjunction with mastication or harvest of dead trees killed by the Pendola fire. Approximately 225 acres of small and medium trees would be piled and burned to reduce the fuel loading.

Underburning and Pile Burning. The effects of the action alternatives are expected to be the same. Underburning is nonselective, and compared to mechanical treatments, it is not as likely that favored species would be retained. Implementation of any of the action alternative may not change the percent composition of pine species in underburn units. According to the HFQLG Act final supplemental EIS (page 19), the overstory canopy is usually not affected by underburning, although torching of individual or small groups of trees can occur on up to 10 percent of the burn area where high surface fuel concentrations and ladder fuels occur together. Torching may result in 0.25- to 0.5-acre gaps in the canopy. According to the HFQLG final supplemental EIS (page 19), the overstory canopy is usually not affected by underburning, although torching of individual or small groups of trees can occur on up to 10 percent of the burn area where high surface fuel concentrations and ladder fuels occur together. Torching may result in 0.25- to 0.5-acre gaps in the canopy. Localized torching from underburning would provide some small openings in the overstory where shade-intolerant species may become established and grow, depending upon the opening size.

3.12.5.3 All Action Alternatives: Direct and Indirect Effects of Group Selection Treatments

Harvesting, Site Preparation, Reforestation, and Release. Group selections within the true fir type may be naturally regenerated. In all other forest types, a combination of natural and artificial regeneration would be used to achieve desired stocking levels, with an emphasis on regenerating shade-intolerant species. Ponderosa pine, Douglas-fir, and rust-resistant sugar pine would be planted. Black oak sprouts would be tended by cutting back all but 2 to 4 of the best sprouts.

The openings created by group selection would mimic fine-scale disturbances such as small fires, localized insect damage, windthrow, and snow events. This would allow sunlight to reach the forest floor, creating favorable conditions for the establishment and growth of planted shade-intolerant, fire-adapted species. Some natural regeneration from seeds of surrounding Douglas-fir, white fir, pines, cedars, and shrub species is also expected to occur in these openings.

After planting, proposed release treatments (grubbing and mastication) in group selection openings would favor pine retention. Without post-planting release treatments, it is expected that shade-tolerant firs and cedars would compete with pine seedlings along group selection edges, under residual trees, and in other low-light areas (such as south slopes) within patches (York et al. 2003, 2004).

Although there has been little research on seedling survival in group selections in the forests of the northern Sierra Nevada, a few experiments have been completed on the Plumas National Forest. For example, McDonald and Abbott (1994) found that growth of ponderosa pine in 30-, 60- and 90-foot radius (approximately 0.1–0.6 acre) group selection units was poor (for example, many seedlings were only 5 inches tall at 9 years old), even though ponderosa pine seed dispersal and seedling germination were extremely high. This shows that edge tree competition—both above ground for light and below ground for nutrients and water—limit growth for species like ponderosa pine that are unable to adapt to low light levels. At the Blodgett Experimental Forest in California, York et al. (2004) found significant increases in seedling/sapling height as opening size increased; effects of opening size on seedling/sapling height leveled off after approximately 1.5 acres.

There is no research on the effect of leaving residual trees within group selection cut patches. The silvicultural intent of the traditional group selection harvest system is to remove all trees within the patch. However, because the 2004 Record of Decision (table 2) on the SNFPA final EIS established the retention of trees greater than 30 inches dbh, there would be residual trees within the Slapjack Project group selection units.

3.12.5.4 All Action Alternatives: Direct and Indirect Effects of Individual Tree Selection (Thinning) Treatments

Individual tree selection units would resemble a DFPZ thinning unit, however 50 percent canopy cover would be maintained. White fir, tanoak, and incense-cedar would be the primary species removed, but some ponderosa pine and Douglas-fir and a very limited number of sugar pine may also be removed. Preference for residual trees would be based on the relative shade intolerance, under representation of the species for large trees on the landscape level, and resistance to fire of the species. Ponderosa pine would be given primary preference, followed by black oak, sugar pine, Douglas-fir, incense-cedar, and white fir. Tanoak would only be left if needed to meet canopy cover standards. In order to meet HFQLG desired conditions and standards, the activity-generated slash, and some existing downed fuel, would be piled and burned after thinning to reduce fuel loading.

3.12.6 Affected Environment (Existing Conditions): Forest Health

Insects and disease have contributed to vegetation composition in the analysis area. Insects will remain at endemic levels as long as precipitation levels are near or above normal. However, when precipitation is below normal for several consecutive years, trees become moisture-stressed and susceptible to insect attacks. As past logging history indicates, there have been numerous salvage sales over the years that generally coincide with drought conditions or, in one case, a Tussock moth infestation. Maintaining trees in good health and vigor reduces the risk of high levels of mortality during years of low water supply.

Insect top kill and whole-tree mortality are found throughout the analysis area. This damage is related to attacks by the fir engraver beetle (*Scolytus ventralis*) in white fir; *Ips* spp. in ponderosa and sugar pine; *Dendroctonus ponderosae* in ponderosa and sugar pine; and *Dendroctonus brevicomis* in ponderosa pine.

Although diseased trees are found throughout the project area, they are most common in overcrowded stands. Overcrowded stands containing a large percentage of white fir almost always contain some amount of annosum (*Heterobasicion annosum*) root disease, which decays tree roots (evidence of the disease has not been verified). When the roots die faster than they can regenerate, the tree will fall over or die. Incense-cedar, ponderosa pine, and sugar pine are resistant to the strain that infects white and red fir. Historically, the forest contained more of these resistant species.

White pine blister rust (*Cronartium ribicola*) is present in the project area. This disease is specific to the five-needle pines: sugar and western white pine. Infections are scattered throughout the area and occur in all tree sizes. This disease has killed some younger trees, and older infected trees show reduced growth and vigor.

Dwarf mistletoe (*Arceuthobium* spp.) is also present in these forest types. Tree growth and vigor are reduced on infected trees with moderate to high dwarf mistletoe ratings.

3.12.7 Environmental Consequences: Forest Health

3.12.7.1 Alternative A (No Action): Direct and Indirect Effects

Problems with diseases (dwarf mistletoe, stem rot, blister rusts), insects (bark beetles), and damage (broken tops, basal wounds) have been observed in ponderosa pine, sugar pine, incense-cedar, and white fir trees within stands in the Slapjack Project area.

As stand growth and vigor continue to decline, these areas would be at a high risk for insect and disease infestations. As Ferrell (SNEP 1996, volume II, chapter 45, pages 1177–1192) summarizes: "Currently, Sierra Nevada forests have high levels of mortality caused by bark beetles infesting trees stressed by drought, fire, overly dense stands, and pathogens. Fuel loads and fire hazard are high . . . . Mitigative restoration requires thinning overly dense stands, primarily by controlled burning in parks and wilderness areas, combined with mechanical thinning and other selective tree-cutting practices elsewhere."

Dwarf mistletoe-infested trees in the overstory would continue to infect understory trees and adjacent stands. The rate of spread of dwarf mistletoe would be more rapid through a multistoried stand with many horizontal layers of foliage than through a single-storied stand (Parmeter 1978; Hadfield and Russell 1978). Stand health would continue to decline in overstocked aggregations of trees within moderately stocked and densely stocked stands, eventually resulting in individual tree mortality. Mortality would increase the fuel loading, but endemic mortality would keep a continuous supply of dead trees for wildlife foraging and nesting.

3.12.7.2 All Action Alternatives: Direct and Indirect Effects of DFPZ Treatments

Mechanical Thinning and Biomass Removal. The action alternatives are each expected to have the same effects. Thinning from below would remove poor vigor, diseased, and damaged trees. In addition, thinning some of the suppressed, intermediate, and codominant tree classes would help maintain the growth and vigor of codominant and dominant conifers—the older, mature, larger trees that would be retained longer in the overstory. Stand health would be maintained or improved, and individual tree mortality would be reduced. The overstocked stands or aggregations within stands would be thinned in order to reduce stress due to inter-tree competition. Stand growth and vigor would be maintained or improved, making stands and aggregations less susceptible to insect attacks (Koehler, Wood, and Scarlett 1978; DeMars and Roettgering 1982).

Mastication and Grapple Piling. The effects of each of the action alternatives are expected to be the same. The removal of competing conifers and brush through mastication would result in better individual tree growth and vigor of remaining conifers. There may also be an opportunity to selectively remove dwarf mistletoe infected trees, which would limit the spread of dwarf mistletoe to adjacent uninfected trees.

Thinning (mastication) would reduce the risk of bark beetle mortality in each stand. When periodic droughts and their associated bark beetle epidemics occur, there is a low probability of extensive pine mortality in the thinned stands. Maintaining good stand growth and vigor would reduce the risk of beetle populations increasing and attacking adjacent stands. Because the conifer stands are currently in the most vigorous growth period of their lifespan, stand densities could again approach undesirable densities within 10 to 15 years after treatment.

Underburning and Pile Burning. The effects of each of the action alternatives are expected to be the same effects. Prescribed burning is nonselective and may not remove diseased or dwarf mistletoe infected trees. Within the DFPZs, dwarf mistletoe trees in the overstory would continue to infect the understory trees and adjacent stands.

3.12.7.3 All Action Alternatives: Direct and Indirect Effects of Group Selection Treatments

Harvesting, Site Preparation, Reforestation, and Release. The effects of the actions alternatives are expected to be the same, except alternatives F and G reduced the total number of group acres from 219 to 190 acres. Most of the dying, damaged, insect-ridden, and diseased trees up to 30 inches dbh would be removed in the group selection harvests. If some of the residual overstory trees or trees in the adjacent stands are infected with dwarf mistletoe, then other species types can be planted in the understory, since dwarf mistletoes are host specific.

3.12.8 Affected Environment (Existing Conditions): Stand Attributes (Canopy Cover, Stand Structure and Tree Size, and Density)

This section describes the existing condition for the following indicators: Canopy Cover, Stand Structure and Tree Size, and Density.

Table 3-44 displays the stand attributes of canopy cover, average tree size or quadratic mean diameter, basal area, and trees per acre for the various treatment groups (CWHR size classes 3, 4, and 5; thinning units; masticate only; and underburn). Stand structure is a description of the distribution of tree size classes (saplings, poles, small trees, etc.) within a stand. Understory and overstory are some other terms that are used in referring to stand structure. The distribution of the various size classes or “stories” determines if a stand is classified as an even-aged, uneven-aged, or multistoried stand. Quadratic mean diameter of the upper story is the diameter of a tree of mean basal area within dominant or codominant positions in the stand. In other words, instead of being an arithmetic average of tree diameters, it is a weighted average based on the basal area of each tree in the upper story within the stand.

Table 3-45 displays the stand structure for the CWHR size class 4 and 5 natural stands for the thinning treatment group. Mastication and underburning units are not shown since neither treatment would result in much change to overstory stand structure.

Table 3-44. Stand attributes by treatment group.

Treatment Group	Percent Canopy			Quadratic Mean Diameter Upper Story	Basal Area	Trees/Acre Greater Than 1 inch DBH
	Lower Limit	Upper Limit	Average			
CWHR[a] 5 - Thin	47	90	61.6	27.7	220	370
CWHR 4 - Thin	47	83	62.7	16.9	189	390
CWHR 3 - Thin	22	60	63.9	9.9	185	721
Masticate	20	58	46.5	17.4	128	354
Hand Cut, Pile, and Burn	57	57	57	31.2	231	629
Underburn	40	82	56.9	17.7	129	330

Note:

a. California Wildlife Habitat Relationships (CWHR) are a system developed jointly by Forest Service Region 5 and the California Department of Fish and Game that classifies forest stands by dominant species types, tree sizes, and tree densities and rates that result classes regarding the habitat value for various wildlife species or plant guilds.

Table 3-45. Trees per acre by size class.

Treatment Group	Sampling (1–6 inch dbh)	Poles (6–11 inch dbh)	Small Trees (11–24 inch dbh)	Medium Trees (24–30 inch dbh)	Large Trees (> 30 inch dbh)	Total
CWHR 5	231	36	43	8	11	330
CWHR 4	236	84	62	5	4	392

The number of trees over 1 inch dbh per acre in the CWHR size class 5 natural stands ranges from 160 to 805 per acre, with an average of 330 trees per acre. The average trees per acre of trees over 1 inch dbh for CWHR size class 4 stands is 392 per acre, and ranges from 183 to 787 trees per acre.

Most of the trees in CWHR size class 4 and 5 stands are in the smaller diameter groups (less than 11 inches dbh). The number of trees greater than 30 inches dbh account for only a small fraction of the total number of trees: 4 trees per acre for CWHR size class 4 stands and 1 tree per acre for CWHR size class 5 stands.

The basal area for CWHR class 5 stands ranges from 70 to 391 square feet per acre, with an average of 194 square feet per acre. Basal area for CWHR class 4 stands is slightly lower, averaging 165 square feet per acre and ranging from 49 to 330 square feet per acre. Average stand tree age in CWHR class 4 and 5 stands varies, but natural stands are approximately 75 to 150 years old with older trees in clumps or scattered individually. Tree canopy cover, not including cover from trees that are less than 6 inches dbh, is generally moderate to dense for CWHR class 5 stands, ranging from 32 percent to 90 percent, with an average of 56 percent. Canopy cover in CWHR class 4 stands averages 60 percent. Within both CWHR class 4 and 5 stands, there are small aggregations or clumps of trees with denser canopy cover.

For both CWHR class 4 and 5 stands, the high number of trees in the smaller diameter groups and the dense canopy indicates high fuel ladder potential and interlocking crowns capable of sustaining crown fires.

There are 1,174 acres of plantations, primarily stocked with pine, within the proposed DFPZ. Of those, only about 5 percent (53 acres) are younger plantations that were established 5 to 15 years ago. The remaining 1,121 acres are older plantations established approximately 20 to 40 years ago. During the regeneration harvests that established these plantations, pine and other mixed conifer species were planted. This helped restore some of the pine species diversity. The plantations also contribute to horizontal diversity—the horizontal arrangement of different age groups of vegetation across the landscape. Currently, plantations in the Slapjack Project area range from 210 to 800 trees that are 1 inch dbh or more, with a 7- to 13-foot spacing between trees. Without thinning, plantations at such high densities are more susceptible to bark beetle attack, increased mortality from inter-tree competition, and increased high fire hazard risk potential.

More specific information about stand attributes of natural stands and plantations is contained in the “Slapjack Silviculture Report” in the project record.

On a landscape scale, table 3-46 shows existing vegetation type, size class distribution, and canopy cover distribution for the Ponderosa Reservoir, Frey Creek, McCabe Creek, New Bullard’s Bar Reservoir, Dobbins Creek, and Lower Dry Creek watersheds (Slapjack Challenge Rapid Landscape Assessment, 2005). Over 80 percent of the acres in each watershed are in the moderate to dense canopy cover classes, which indicates multiple canopy layers and interlocking crowns.

The Slapjack Rapid Landscape Assessment pointed out several differences between existing condition and desired condition for age group and size classes. As shown in table 3-47 below, existing conditions for the large tree class is under represented, the seedling and small tree classes are slightly above desired, and the pole size class is also over represented. The proposed fuel treatments and group selection harvests of the Slapjack Project would move some of these classes toward desired conditions. Implementation of the HFQLG group selection harvests over 175 years would move the current tree size classes towards the desired size class distribution.

3.12.9 Environmental Consequences: Canopy Cover

3.12.9.1 Alternative A (No Action): Direct and Indirect Effects

With fire exclusion, an understory of fir, tanoak, incense-cedar, and Douglas-fir has developed beneath the overstory, creating a multistoried stand, with moderate to dense canopy closure, that currently ranging from 47 to 87 percent in CWHR class 4 and 5 stands (table 3-48). The canopy closure for the CWHR class 3 (thin group), plantations (masticate group), and other stands (underburn group) range from 20 to 82 percent. Without treatment, the canopy closure in these stands, especially in the plantations, would continue to increase. The increased canopy closure would shade out brush and smaller trees, which would die and increase the ladder fuels and fire hazard.

Table 3-46. Forest vegetation data for the Ponderosa Reservoir, Frey Creek, McCabe Creek, New Bullard's Bar Reservoir, Dobbins Creek, and Lower Dry Creek watersheds.

Vegetation Data Within Proclaimed National Forest	Ponderosa Reservoir 123 06 03		Frey Creek 123 07 01		McCabe Creek 123 07 02		New Bullard's Bar Reservoir 125 02 03		Dobbins Creek 125 05 01		Lower Dry Creek 125 07 01	
	Acres[a]	Percent	Acres[a]	Percent	Acres[a]	Percent	Acres[a]	Percent	Acres[a]	Percent	Acre[a]s	Percent
Vegetation Type												
Urban	0.1	0.0	0	0.00	0	0.0	23.1	0.1	0	0.0	2.4	0.1
Barren	61.9	0.7	0	0.0	0	0.0	107.8	0.6	0	0.0	11.4	0.3
Water	65.4	0.7	148.8	4.5	0	0.0	430.4	2.6	0	0.0	0	0.0
Annual grassland	54.0	0.6	0	0.0	0	0.0	0	0.0	0	0.0	6.4	0.2
Shrub types (mixed chaparral, montane chaparral)	184.9	2.1	54.1	1.6	0	0.0	111.0	0.7	0	0.0	18	0.5
Lower west-side hardwoods	0.7	0.0	43.2	1.3	0	0.0	0	0.0	0	0.0	1.7	0.0
Montane hardwoods	3,456.6	39	1,263.2	38.5	99.5	21.2	3,241.6	19.5	29.1	7.0	691.3	17.4
Pine (eastside and ponderosa pine)	1,405.4	15.9	883.5	26.9	272.0	58.0	146.8	0.9	116.6	27.9	349.2	8.8
Sierran mixed conifer (including Douglas-fir)	3,637.2	41.0	889.4	27.1	97.4	20.8	12,561.0	75.6	271.7	65.1	2,885.3	72.8
True fir (white fir and red fir)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	**8,866.2**	**100.0**	**3,282.2**	**100.0**	**468.9**	**100.0**	**16,621.7**	**100.0**	**417.4**	**100.0**	**3,965.7**	**100.0**
Size Class Distribution												
0 Miscellaneous (barren, water, grassland, shrubs)	383.60	4.3	202.90	6.2	0.00	0.0	693.40	4.2	0.00	0.0	38.20	1.0
1 Seedling (<1 inch dbh)	0.00	0.0	32.30	1.0	0.00	0.0	22.10	0.1	0.00	0.0	2.50	0.1
2 Sapling (1–6 inches dbh)	30.80	0.3	15.20	0.5	0.00	0.0	486.40	2.9	0.00	0.0	154.60	3.9
3 Pole (6–11 inches dbh)	1,826.80	20.6	635.00	19.3	9.30	2.0	2205.90	13.3	33.48	8.0	375.70	9.5
4 Small tree (11–24 inches dbh)	2,874.00	32.4	1,192.60	36.3	254.45	54.3	4582.60	27.6	73.15	17.5	1,113.50	28.1
5 Large tree (>24 inches dbh)	3,751.00	42.3	1,204.20	36.7	205.15	43.8	8631.20	51.9	310.81	74.5	2,277.00	57.4
6 Two story	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	4.20	0.1
Total	**8,866.20**	**100.0**	**2,729.30**	**100.0**	**468.90**	**100.0**	**16,621.60**	**100.0**	**417.44**	**100.0**	**3,965.70**	**100.0**

Table 3-46. Forest vegetation data for the Ponderosa Reservoir, Frey Creek, McCabe Creek, New Bullard's Bar Reservoir, Dobbins Creek, and Lower Dry Creek watersheds (continued).

Vegetation Data Within Proclaimed National Forest	Ponderosa Reservoir 123 06 03		Frey Creek 123 07 01		McCabe Creek 123 07 02		New Bullard's Bar Reservoir 125 02 03		Dobbins Creek 125 05 01		Lower Dry Creek 125 07 01	
	Acres[a]	Percent	Acres[a]	Percent	Acres[a]	Percent	Acres[a]	Percent	Acres[a]	Percent	Acre[a]s	Percent
Canopy Closure Distribution												
NA (0-9) (barren, water, grassland, shrubs)	383.57	4.3	235.19	7.2	0.00	0.0	715.55	4.3	0.00	0.0	40.69	1.0
S – Sparse (10-24)	18.19	0.2	0.00	0.0	0.00	0.0	25.85	0.2	0.00	0.0	0.79	0.0
P - Open (25-39)	196.86	2.2	160.49	4.9	10.68	2.3	365.65	2.2	0.00	0.0	134.43	3.4
M - Moderate (40-59)	1,289.60	14.5	616.45	18.8	42.21	9.0	928.82	5.6	31.40	7.5	233.61	5.9
D - Dense (60-100)	6,977.96	78.7	2,270.05	69.2	416.01	88.7	14,585.72	87.8	386.04	92.5	3,556.17	89.7
Total	**8866.18**	**100.0**	**3,282.18**	**100.0**	**468.9**	**100.0**	**16,621.59**	**100.0**	**417.44**	**100.0**	**3965.69**	**100.0**

Note: a. Acreage is for National Forest System land only and does not include private property.

Table 3-47. Existing condition and desired condition for tree size class distribution for Ponderosa Reservoir, Frey Creek, McCabe Creek, New Bullard Bar Reservoir, Dobbins Creek, and Lower Dry Creek watersheds.

Size Class	Size (dbh)	Approximate Group Age	Estimated Prior to European Settlement	Ponderosa Reservoir Existing Condition	Frey Creek Existing Condition	McCabe Creek Existing Condition	New Bullard's Bar Reservoir Existing Condition	Dobbins Creek Existing Condition	Lower Dry Creek Existing Condition	Desired Under Regulation[1]
0	Nonforest	NA	Unknown[a]	4.3%	7.4%	0%	4.2%	0%	1.0%	
1-2	<6 inch	0–20	15%	0.3%	1.8%	0%	3.0%	0%	4.0%	10%
3	6–11 inches	20–40	13%	20.6%	3.0%	2.0%	13.3%	8.0%	9.5%	10%
4	11–24 inches	40–100	18%	32.4%	43.7%	54.3%	27.6%	17.5%	28.1%	30%
5	>24 inches	100–200	53%	42.3%	44.1%	43.8%	51.9%	74.5%	57.4%	50%

Source: "Existing Conditions" is from Plumas National Forest "e-veg" 97-5 Forest Vegetation Typing. The "Estimated Prior to European Settlement Conditions" are from averages for the ponderosa pine, Douglas-fir, and white fir ecological groups in the Challenge Rapid Landscape Assessment.

Note: a. While the percent of the nonforest types in each watershed is not knows, it is probably close to existing conditions except for the "Water" type from reservoirs. This includes 0.7 percent of Ponderosa, 2.9 percent of Frey Creek, and 1.6 percent of Bullard's Bar watersheds. Based on the HFQLG desired condition for uneven-aged management with a regulation period of approximately 175 years.

Table 3-48. Canopy cover summary by treatment group for each alternative.

Treatment Group	Alternative A Lower Limit Canopy Cover	Alternative A Upper Limit Canopy Cover	Average Percent Canopy Cover (By Alternative)						
			A	B	C	D	E	F	G
CWHR class 5 - thin	47	87	62	40	40	40	40	40	40
CWHR class 4 - thin	47	83	63	40	40	40	40	40	40
CWHR class 3 - thin	22	60	64	NA	NA	NA	NA	NA	NA
Masticate	20	58	47	NA	NA	NA	NA	NA	NA
Hand Cut, Pile, and Burn	57	57	57	NA	NA	NA	NA	NA	NA
Underburn	40	82	66	NA	NA	NA	NA	NA	NA

Note:

NA = canopy cover requirements not applicable to these treatment groups.

3.12.9.2 All Action Alternatives: Direct and Indirect Effects

DFPZ Treatments: Mechanical Thinning and Biomass Removal. The most effective strategies for reducing crown fire occurrence and severity are to (1) reduce surface fuels, (2) increase height to live crown, (3) reduce canopy bulk density, and (4) reduce continuity or density of the forest canopy (Graham et al. 2004; Peterson et al. 2005).

The treatments in the DFPZs should result in a fairly open stands, dominated by larger, fire-tolerant tree species. Post-treatment canopy closure generally should not exceed 40 percent, although adjustments in stand density based on local conditions may be appropriate (Weatherspoon and Skinner 1996).

Canopy cover in CWHR size class 5 treatment group in the project area currently ranges from 47 to 87 percent, with an average of 62 percent. Canopy cover in CWHR size class 4 treatment group is quite similar, ranging from 47 to 83 percent and averaging 63 percent.

For alternative B, post-treatment canopy cover would average 40 percent in CWHR size class 5 and size class 4 stands (Slapjack Project Silviculture Report, appendix A). The effects of alternatives C, D, E, F, and G are expected to be the same as alternative B, since 40 percent canopy cover is desired after thinning for each stand ("Slapjack Project Silviculture Report," appendix A). All actions alternatives would meet the canopy requirements for CWHR size class 4 and class 5 stands listed in table 2 of the SFNPA Record of Decision.

DFPZ Treatments: Mastication. Mastication would change the canopy cover of the plantations with interlocking and overlapping crowns to a more open condition with gaps between tree crowns. For all action alternatives, canopy cover would generally average from 15 to 30 percent in plantations. The effects of each action alternative on density are expected to be the same. Plantations would be thinned to approximately 90 to 135 trees per acre, or an 18- to 22-foot spacing between trees, depending on the size of trees. The post-treatment canopy cover in stands of larger sized trees would average 40 percent in both CWHR size class 4 and class 5 stands ("Slapjack Project

Silviculture Report," appendix A.) Mastication in these stands would be limited to primarily understory trees.

DFPZ Treatments: Underburning and Pile Burning. Prescribed burning would remove most of the understory vegetation and some overstory trees through localized torching. Depending on prescribed burning conditions (low intensity versus high intensity), localized torching would be low, and the change to canopy cover would be minimal. All action alternatives are expected to have the same effects.

Group Selection Treatments: Harvesting, Site Preparation, Reforestation, and Release. The residual canopy cover of trees greater than 30 inches dbh would range from 0 to 34 percent for all stands. CWHR size class 4 and class 5 stands would have an average of 11 and 22 percent canopy cover, respectively.

Individual Tree Selection Treatments: Harvesting and Fuel Treatment. The residual canopy cover of trees would be 50 percent for all stands. All actions alternatives would meet the canopy requirements for CWHR class 4 and CWHR class 5 stands listed in table 2 of the SFNPA Record of Decision.

3.12.10 Environmental Consequences: Stand Structure and Tree Size

3.12.10.1 Alternative A (No Action): Direct and Indirect Effects

Under alternative A, trees in the suppressed and intermediate crown classes would continue to provide ladder fuels into the overstory crown canopy. Currently, all treatment groups have relatively low quadratic mean diameters, meaning that there is a high proportion of smaller tree size classes. Existing conditions across the project area, including multiple size classes, low quadratic mean diameters, and dense canopy, indicate high fuel ladder potential and interlocking crowns capable of sustaining crown fires (see tables 3-49 and 3-50 below). Tables A-15 and A-16 in appendix A of the "Slapjack Project Silviculture Report" list the stand structure for each stand.

Table 3-49. Canopy cover by tree size class for CWHR size class 4 and class 5 stands.

	Canopy Cover Percent by Tree Size Class[a]					
	Sapling 1–6 inches dbh	Poles 6–11 inches dbh	Small Trees 11–24 inches dbh	Medium Trees 24–30 inches dbh	Large Trees 30 inches dbh or greater	Total Cover
CWHR Size Class 4						
Before Treatment	19	19	30	7	11	60
After Treatment (Alternatives B – G)	0	2	22	7	11	40
CWHR Size Class 5						
Before Treatment	20	12	30	11	22	56
After Treatment (Alternatives B – G)	0	1	11	9	22	40

Note:

a. Sums of canopy cover by size do not sum to "Total Cover" because of overlapping.

Table 3-50. Trees per acre by size class for CWHR size class 4 and 5 stands.

	Trees per Acre by Tree Size Class					
	Sapling 1–6 inches dbh	Poles 6–11 inches dbh	Small Trees 11–24 inches dbh	Medium Trees 24–30 inches dbh	Large Trees 30 inches dbh or greater	Total Trees per Acre
CWHR Size Class 4						
Before Treatment	191	97	52	5	5	320
After Treatment (Alternatives B – G)	2	6	35	5	5	53
CWHR Size Class 5						
Before Treatment	241	39	47	9	12	348
After Treatment (Alternatives B – G)	5	3	14	7	12	41

3.12.10.2 All Action Alternatives: Direct and Indirect Effects

DFPZ Treatments: Mechanical Thinning and Biomass Removal. Under all action alternatives, thinning would occur from below to remove ladder and canopy fuels. This would increase ground-to-crown height, spacing between trees, and spacing between tree crowns. Removal of suppressed, intermediate, and some codominant trees with crowns beneath and adjacent to healthy larger trees would be emphasized. It is estimated that about two trees per acre that are between 24 and 30 inches dbh would be removed due to poor crowns, defects, disease, insect damage, or because their crowns are beneath those of larger trees (those greater than 30 inches dbh).

Tables 3-49 and 3-50 above display existing stand structure attributes (average canopy cover percent and trees per acre by tree size class) for CWHR class 4 and class 5 stands in the project area. Canopy cover in the smaller tree size classes (saplings, poles, and small trees) would be reduced substantially after thinning, thus reducing the fuel ladder and canopy fuels.

The 2004 Record of Decision on the SNFPA final supplemental EIS requires that projects be designed to retain, where available, at least 5 percent of total treatment area in lower layers comprised of trees 6 to 24 inches dbh. For the Slapjack Project, this requirement would be met in all treated stands, as displayed in table 3-50 above. Tables A-15 through A-19 of the “Slapjack Project Silviculture Report” displays the canopy cover and trees per acre by size class for each treatment unit.

The effects of all action alternatives would be the same as the effects to reduce canopy to about 40 percent. Tables A-15 through A-19 in appendix A of the “Slapjack Project Silviculture Report” show the canopy cover and trees per acre by size class for each treatment unit. Fuel ladder would be reduced under the action alternatives, and tree crowns would be spaced farther apart. Since the lowest layer of the canopy would be almost eliminated, horizontal diversity would be reduced.

Some trees greater than 30 inches dbh would be removed for operability during new temporary road construction (3.2 miles), reconstruction of existing system and nonsystem roads (20.9 miles), new landing construction (160 landings), and existing landing reconstruction (40 landings). Approximately 80 acres would be affected by these activities. Since most of the work would use

existing facilities, and almost 70 percent of the harvesting would be in CWHR size classes 3 and 4, an estimated 6 trees per acre, or a total of 480 trees (less than 2 percent for the project area) greater than 30 inches dbh, may be removed.

All action alternatives would increase the quadratic mean diameters for each treatment group (see table 3-51 below). This indicates that there would be a higher proportion of medium to large size trees in the stand, which would reduce the ladder fuels and fire hazard. Tree growth and vigor would also improve (refer to the "Environmental Consequences: Forest Health" section 3.12.7 above).

Table 3-51. Quadratic mean diameters for each treatment group.

Treatment Group	Quadratic Mean Diameter (inches dbh)	
	Alternative A (No Action)	Alternatives B – G (Action Alternatives)
CWHR class 5 – thin	12	29
CWHR class 4 – thin	11	22
CWHR class 3 – thin	10	15
Masticate	9	17
Underburn	11	21
Hand cut, pile, and burn	8	32

The most substantial change in the quadratic mean diameters of trees over 1 inch dbh would be seen in the CWHR size class 4 and class 5 stands. Under all action alternatives, the quadratic mean diameters in units, which are in CWHR size classes 4 and 5, would increase considerably from between 11 and 12 inches dbh to between 22 and 29 inches dbh.

DFPZ Treatments: Mastication. All action alternatives are expected to have the same effects. Mechanical mastication would change the structure (by reducing ladder fuels), density, and size of fuels in the stand but would not necessarily change the total fuel loading. The quadratic mean diameters or tree size of the residual stand would increase (refer to table 3-51 above).

DFPZ Treatments: Underburning and Pile Burning. The effects of each of the action alternatives are expected to be the same. Prescribed burning would change stand structure by burning the understory vegetation and the suppressed and intermediate tree sizes. However, larger vegetation that is not consumed by the prescribed burn would be left standing after treatment. Some stands would still experience some stress after treatment due to competition with brush species that were not consumed in the underburn treatments.

Group Selection Treatments: Harvesting, Site Preparation, Reforestation, and Release. Group selection treatments would create small patches of young regeneration, changing the stand structure in and near the treatment unit. Trees greater than 30 inches dbh in group selection openings, as well as all trees bordering group selection openings, are expected to respond to the reduced competition by increasing growth. This would cause further diversification of canopy layers through the development of large dominant overstory trees. York et al. (2004) found a 30 percent increase in growth in trees along group selection borders compared to trees growing within the group selection matrix.

Alternatives B through E call for 219 acres of group selection harvest. Implementation of group selection treatments would create two distinct structures: (1) the overstory comprised of residual trees greater than 30 inches dbh, and (2) planted and natural conifer seedlings. The effects of alternative F are expected to be the same as alternative B, except that in order to reduce impacts on watersheds over the Threshold of Concern, the group acres were reduced to 190.

Individual Tree Selection Treatments: Harvesting and Release. The effects on the 148 acres proposed for individual tree selection would be similar to the effects from thinning for DFPZ construction. The major difference is that 50 percent canopy would be retained. On average, the quadratic mean diameter of trees over 1 inch dbh would be raised from 11 inches to about 27 inches. Canopy cover would be decreased from an existing average of about 78 percent to 50 percent, while trees per acre would be reduced from about 466 to about 47 trees per acre.

3.12.11 Environmental Consequences: Density (Basal Area and Trees per Acre)

3.12.11.1 Alternative A (No Action): Direct and Indirect Effects

Table 3-52 shows basal area and trees per acre for the various treatment groups in the DFPZs. Alternative A represents the existing condition. The high number of trees per acre across all treatment groups indicates overstocked conditions, compared with the Dunning and Reineke (1933) data from natural stands. Their data indicates that the trees per acre range from 71 to 165 in well-stocked, second-growth 100- to 150-year-old mixed conifer stands. However, the desired trees per acre in DFPZ units would be lower in order to ensure effectiveness of the treatments. For plantations, the desired trees per acre for the second decade would lower tree density to between 100 and 150 well-distributed trees per acre, and shrub cover would be maintained between 10 and 20 percent (SNFPA final EIS, volume 1, chapter 2, page 57).

Table 3-52. Basal area and trees per acre in proposed DFPZs.

Treatment Group	Alternative A (No Action)		Alternatives B – G (Action Alternatives)	
	Basal Area (in square feet)	Trees Per Acre	Basal Area (in square feet)	Trees Per Acre
CWHR class 5 – thin	220	370	149	93
CWHR class 4 – thin	189	390	127	70
CWHR class 3 – thin	185	721	106	134
Masticate	128	354	110	134
Underburn	128	329	103	164
Hand Cut, Pile, and Burn	231	629	165	29

Stands, and aggregations within stands, that are currently overstocked or understocked with dense brush cover would continue to experience stress due to high levels of inter-tree or brush competition (refer to the “Environmental Consequences: Forest Health” section 3.12.7 above). Basal area standards in table 2 of the SNFPA Record of Decision only apply to treatment group CWHR size class 4 and 5 stands.

3.12.11.2 All Action Alternatives: Direct and Indirect Effects

DFPZ Treatments: Mechanical Thinning and Biomass Removal. Thinning the understory would reduce the stocking density of the trees in the suppressed and intermediate crown classes, which would reduce the amount of ladder fuels growing underneath the overstory crown canopy (see Stand Structure Indicator). Reducing tree density would improve tree growth and vigor, reduce susceptibility to drought and bark beetle attacks (see Forest Health Indicator), and reduce fire hazard (see Fire and Fuels Indicator). For all action alternatives, approximately 67 percent of the existing basal area would be retained for CWHR size class 4 and 5 stands. All action alternatives would meet the requirements of retaining 30 percent of the existing basal area for CWHR 4 stands and 40 percent of existing basal area for CWHR 5 stands.

DFPZ Treatments: Mastication. The effects of each of the action alternatives are expected to be the same. Plantations would be thinned to approximately 90 to 135 trees per acre, or 18 to 22 foot spacing between trees, depending upon the size of trees. Reducing tree density would improve tree growth and vigor, reduce susceptibility to drought and bark beetle attack (see Forest Health Indicator), and reduce fire hazard (see Fire and Fuels Indicator)

DFPZ Treatments: Underburning and Pile Burning. The effects of each of the action alternatives are expected to be the same. Prescribed burning would change the basal area and trees per acre by consuming or killing the suppressed (seedlings, saplings), intermediate (poles, small trees) and some codominant (small trees, medium trees) size classes.

Group Selection Treatments: Harvesting, Site Preparation, Reforestation, and Release. The effects of each of the action alternatives are expected to be the same, except alternatives F and G have less group acres. The number of trees per acre of the residual trees greater than 30 inches dbh within the group selection areas averages 5 to 12 trees per acre for CWHR size class 4 and 5, respectively. The group selection openings would probably be planted with shade-intolerant species on 10- to 12-foot spacing or 300 to 435 trees per acre.

Individual Tree Selection Treatments: Harvesting and Release. The effects on the 148 acres proposed for individual tree selection would be similar to the effects from thinning for DFPZ construction. The major difference is that 50 percent canopy would be retained.. Canopy cover would be decreased from an existing average of about 78 percent to 50 percent, while trees per acre would be reduced from about 466 to about 47 trees per acre.

3.12.12 Affected Environment (Existing Conditions): Harvest Volume

Existing Condition. Potential harvest volumes for DFPZ and individual tree selection units would range from 1,500 to 10,000 board feet per acre. Potential harvest volumes for groups would range from 10,000 to 30,000 board feet per acre.

3.12.13 Environmental Consequences: Harvest Volume

3.12.13.1 Alternative A (No Action): Direct and Indirect Effects

No timber products (commercial firewood, biomass chips, or sawlogs) would be provided to the local economy.

3.12.13.2 All Action Alternatives: Direct and Indirect Effects

DFPZ Treatments: Mechanical Thinning and Biomass Removal. DFPZ thinning under alternatives B through E would provide approximately 9.8 million board feet of sawlogs and 34,000 tons of biomass to the local community (see the "Slapjack Project Silviculture Report," appendix A). Under alternatives F and G, sawlog and biomass volume would be the same and the DFPZs would be treated in the same way.

DFPZ Treatments: Mastication. No sawlogs or biomass would be generated from mastication, grapple pulling, hand cutting, pruning, and piling treatments in alternatives B through G.

DFPZ Treatments: Underburning and Pile Burning. No sawlogs or biomass would be generated from underburning or pile burning treatments in alternatives B through G.

Group Selection Treatments: Harvesting, Site Preparation, Reforestation, and Release. Under alternatives B through E, approximately 3.3 million board feet of sawlogs would be generated through the harvest of 219 acres of group selection units. Alternatives F and G would harvest 190 acres of group selection and generate approximately 2.9 million board feet of sawlogs.

Individual Tree Selection Treatments: Harvesting and Release. Under alternatives B through E, approximately 0.9 million board feet of sawlogs would be generated through the harvest of 148 acres of individual tree selection units. Alternatives F and G would harvest the same 148 acres of group selection units and generate approximately 0.9 million board feet of sawlogs.

3.12.14 Affected Environment (Existing Conditions): Effectiveness of DFPZ Maintenance with Herbicides

The only recent use of herbicides on the Plumas National Forest is associated with ongoing studies in the Challenge Experimental Forest, and only a few acres have been treated with herbicides in recent years.

3.12.15 Environmental Consequences: Effectiveness of DFPZ Maintenance with Herbicides

3.12.15.1 Alternative A (No Action): Direct and Indirect Effects

No DFPZs would be created, so no maintenance would be needed.

3.12.15.2 Alternatives B, E, and F: Direct and Indirect Effects Herbicide Treatments

Areas to be Treated. Approximately 1,954 acres in DFPZs (where tanoak comprises more than 10 percent of the stand) would be sprayed with imazapyr after construction of the DFPZs. Within the DFPZ units, there are about 737 acres are in CWHR size class 5 stands; about 1,030 acres are in size class 4 stands, and about 187 acres are in size class 3 stands.

Effects of Herbicide Treatment. Imazapyr is a broad-spectrum, nonselective herbicide used to control broadleaf weeds, grasses, brush, and trees. The effects of herbicide use were analyzed in the HFQLG Act final supplemental EIS (USDA Forest Service 2003a). Alternative E, the selected alternative in the Record of Decision on that EIS, includes the use of this herbicide as the selected maintenance strategy. The analysis in the HFQLG final supplemental EIS includes effects on Old Forest Associated Species (pages 3-47 to 3-60); Watershed and Aquatic/Riparian Protection (pages 3-61 to 3-244); Socio-Economic Well-being, including Human Health and Safety (pages 3-249 to 3-273); and Wildfire Hazard Reduction and Fuel Management, including Air Quality and Fire Behavior (pages 3-274 to 3-296). The HFQLG Act final supplemental EIS and Record of Decision found no significant adverse effects on human health, ecosystem health, or any other environmental resource from herbicide use. It also found that particular vegetation types were identified for maintenance treatment with herbicides "because hardwoods, in particular tanoak, and sprouting shrubs are easily eradicated with herbicides, and show little or no regrowth after application, but are difficult or expensive to control with mechanical or hand methods."

Length of Time That Treatment Would be Effective. The HFQLG final supplemental EIS estimated that initial treatment of DFPZs would generally be effective for 10 years, except in the brush and plantation types where the estimate was 5 years, in mixed conifer and tanoak type the estimate was 10 years, and in the red fir type the estimate was 30 years. Subsequent maintenance was estimated to be needed at the same intervals (HFQLG final supplemental EIS pages 2-22 and 2-23). No applicable studies have been completed on shrub treatment under a canopy. The recently initiated "Alternatives to Fire for Fuel Reduction at California's Forest Urban Interface" (Powers et al. 2005) does give some indication about the effectiveness of different treatments, including both manual and chemical treatment. Second-growing-season results indicate that biomass from understory rebuild is much lower after the use of herbicides. Studies done in open-sky conditions, in clearcut, or in converted shrubfields indicate chemical treatment is 90–95 percent effective in reducing shrub cover after 10 to 12 years. These same studies indicate manual or mechanical treatment is about 80 percent effective in reducing shrub cover after the same period.

Cost of Treatment. The HFQLG final supplemental EIS treatment regime for maintenance of DFPZs was used to find the discounted costs for the treatment over the 50 to 52 year period used in the final supplemental EIS. This cost was compared to the discounted costs for the alternative maintenance treatments of mechanical (mastication) or underburning. Herbicides would be applied 2, 12, 22, 32, 42, and 52 years after construction. The cost per acre used for the analysis was $250 per acre for herbicide treatment (HFQLG final supplemental EIS page 2-32). The costs per acre for mechanical treatment and underburning cost are locally experienced costs, which have been increased to account for increased fuel costs. These costs are $600 per acre for mechanical treatment and $250 per acre for underburning. These treatments would be done 2, 10, 20, 30, 40, and 50 years after construction. The Forest Service standard discount rate of 4 percent per year was used to discount

future costs to present values. This analysis indicates underburning is the least costly method of maintenance at a current net value of about $447 per acre. Herbicide application is the second least costly method at $645 per acre. Mechanical treatment was the most expensive with a discounted cost of $1,074 per acre.

3.12.15.3 Alternatives C and G: Direct and Indirect Effects of No Herbicide Treatments

No herbicide use is proposed for alternatives C and G. All 4,400 acres of DFPZs would be maintained by using a combination of mechanical, underburning, and possibly, manual methods. The treatment units would be monitored to determine if they are still effective over time. By not including the use of herbicides at this time for the Slapjack Project, their future use for DFPZ maintenance is essentially precluded. If harvest or mastication does not achieve DFPZ objectives in all treatment units, an underburn would be used as a follow-up treatment to meet short-term objectives. Harvested units could also receive a follow-up mastication treatment. In the long-term, the foreseeable maintenance of DFPZs would consist of prescribed fire, mechanical (mastication and grapple pulling), and hand treatments. Specific maintenance treatments would be determined based on site-specific analysis of land allocations, slopes, vegetation types, and previous underburning treatments

3.12.16 Cumulative Effects

3.12.16.1 Alternative A

Historically, stands in the Slapjack Project area had a higher component of shade-intolerant species such as ponderosa pine, Douglas-fir, and sugar pine in the overstory. Under the no-action alternative, the understory would be composed primarily of shade-tolerant species such as white fir, tanoak, and incense-cedar, with very few shade-intolerant species. The survival of shade-intolerant seedlings would not be assured because not enough sunlight would reach the ground. Unless fire or some other disturbance creates some openings, the cumulative effect of maintaining the existing stand structure would be a gradual decline of shade-intolerant species in the overstory.

Overstocked areas and stressed trees, such as those currently found across the Slapjack Project area, are more susceptible to disease and insect infestations. If left untreated, adjacent trees, and eventually adjacent stands, would become infected as the outbreak spreads. Stand growth and vigor would continue to decline. Suppressed and intermediate tree mortality would increase. The cumulative result would be an increase of dead and dying trees that would contribute to fuel ladder build-up.

CWHR Size Class Analysis – Alternative A would not change the current CWHR size classes, unless a major disturbance such as wildfire, bark beetle infestation, or disease were to occur in the project area.

3.12.16.2 All Action Alternatives

DFPZ Treatments. The removal of trees that are diseased or invested with insects, especially around stand boundaries, would prevent the spread of dwarf mistletoe to the understory or adjacent stands. If some dwarf mistletoe-infected trees larger than the lower diameter limit (30 inches dbh for alternatives B and C and 20 inches dbh for alternative D) were retained in the stand, thinning would maintain or improve the vigor of the infected tree, allowing it to outgrow and/or better tolerate the infestation (Scharpf and Parmeter 1976, 1982). With improved vigor, the infected trees would be less susceptible to bark beetle attack. Furthermore, since dwarf mistletoe is host-specific, thinning operations would be able to selectively leave nonhost tree species in the understory.

CWHR Size Class Analysis – Under alternatives B through G, DFPZ thinning would convert stands with dense (greater than 60 percent) canopy cover into stands with open (25–39 percent) or moderate (40–59 percent) canopy cover. In addition, removal of the smaller trees would increase the quadratic mean diameter of the residual stand, moving stands to the next crown size or dbh size class (that is, from CWHR size class 3 to 4). Removing the smaller trees would also increase the quadratic mean diameter of the residual stand.

Overall, there would be little difference in size and canopy cover classes between the alternatives since the only difference is that alternatives F and G propose 29 acres less of group selection.

Group Selection Treatments. Over time, implementation of group selection on a landscape scale would enhance the health and vigor of stands, maintain a wide range of tree ages and size classes from seedlings to large diameter trees, and achieve or maintain desired stocking levels.. Uneven-aged management, and group selection in particular, would result in vertical and horizontal structure more closely associated with pre-settlement forest conditions by breaking up canopy continuity and reducing ladder fuels. This would help change the structure of the forests from even-aged (same-aged), with a high risk fire ladder potential, to the desired condition of an uneven-aged, multistory, fire-resilient forest structure. Long-term fire resilience of forested landscapes would be maintained by small group selections conducive to regeneration of fire-resistant and shade-intolerant species such as ponderosa pine. Group selections would permit the maintenance of single canopy layers in any given location, thereby discouraging crown fires (Weatherspoon 1996; Weatherspoon and Skinner 1996).

Because fewer acres of group selection would be implemented under alternatives F and G (190 acres) compared to alternatives B through E (219 acres), there would be fewer 1- to 2-acre openings for the regeneration and establishment of shade-intolerant species. Therefore, there would be less long-term change in species composition than under alternatives B through E.

CWHR Size Class Analysis – Group selection harvest under alternative B would convert stands with open (25–39 percent), moderate (40–59 percent), or dense (greater than 60 percent) canopy cover into stands with 0–9 percent or 10–24 percent (sparse) canopy cover. Group selection units with residual large conifers (greater than 30 inches dbh) would develop into multilayered CWHR size class 6 stands once the planted and natural conifer seedlings become established and contribute to canopy cover.

3.12.17 Summary of Cumulative Effects

Table 3-53 lists the past actions in the Slapjack Project area for the past 25 years. These activities have contributed to the forming of existing conditions in the Slapjack Project area. Clearcuts created the current younger stands, while thinning and group selection cutting reduced stocking and canopy and allowed for faster growth of residual trees. The salvage cutting removed dead trees from areas of fire or insect activity. The cumulative effects of past projects were taken into account for the GIS analysis of timber type, which was based on year 1997 aerial photograph interpretation. Aerial photograph interpretation analyzed all size classes (saplings, poles, small trees, etc.) and canopy cover (open, sparse, moderate, and dense) for each of the timber or vegetation types within the "e-veg" coverage area. This analysis is on file at the Feather River Ranger District in Oroville, California. There are no foreseeable DFPZ thinning or group and individual tree selection harvests in the Slapjack Project area.

Table 3-53. Past activities in Slapjack Project area by decade.

Activity by Decade	Acres
Clearcut 1980s	1,166
Clearcut 1990s	254
Clearcut 2000s	81
Thinning 1980s	45
Thinning 1990s	481
Selection 1980s	120
Salvage 1980s	33
Salvage 1990s	16
Salvage 2000s	128
Total	2,324

The majority of projects listed in the "Slapjack Project Silviculture Report," appendix A, would have no cumulative effects on vegetation attributes (such as species composition, forest health, canopy cover, and seral stage diversity) since they are outside the Slapjack Project area, the Feather Falls and Challenge Management Areas, or are projects with limited impact on vegetation, such as mining claims and special use permits. The desired conditions for maintaining various seral stages or timber strata by vegetation type, size class, and canopy cover (CWHR) does not include lands from private property. Therefore, harvest or thinning projects on private property would have no cumulative effects on vegetation attributes for the Slapjack Project. Furthermore, the one known project, the Noxious Weed Treatments, would have no cumulative effects because the treatments would not change vegetation attributes.

Seral Stage Diversity. Two projects, Watdog and Sugarberry, would have minimal cumulative effects on seral stage diversity. The Watdog and Sugarberry Projects are outside the Slapjack Project area . The Watdog DFPZ Project would affect less than 4 percent of the Feather Falls Management Area 10 (Slapjack Project Silviculture Report, appendix A). The proposed mastication (98 acres or 0.4 percent of management area) and underburning (614 acres or 2.3 percent of management area) treatments would not change seral stage diversity. The thinning from below treatments would have

minimal effects on seral stage diversity. The thinning from below (287 acres or 1.1 percent of management area) would slightly decrease stands with dense (greater than 60 percent) canopy cover (totaling 225 acres) into stands with moderate (4–59 percent) canopy cover.

The Sugarberry Project proposes approximately 1,500 acres of group selection and 500 acres of individual tree selection treatments. About 1,490 acres of land available and suitable for group and individual tree selection is the Sugarberry Project area are within the Challenge Management Area. Group selection harvest (150 acres or 0.3 percent of the management area and 0.7 percent of National Forest System land in the management area) would change the stands with open (25–39 percent), moderate (40–59 percent), or dense (greater than 60 percent) canopy cover into stands that would be nonstocked (0–9 percent) or sparse (10–24 percent) canopy cover ("Slapjack Project Silviculture Report," appendix A). The individual tree selection treatments (150 acres or 0.3 percent of the management area) would slightly decrease stands with dense (greater than 60 percent) canopy cover into stands with moderate (40–59 percent) canopy cover ("Slapjack Project Silviculture Report," appendix A).

DFPZ Maintenance. The Record of Decision for the HFQLG final supplemental EIS was signed in July 2003. The EIS documented the results of the effects of alternative management strategies for maintenance of DFPZs in the HFQLG Pilot Project area. The final supplemental EIS and Record of Decision, in combination with the original HFQLG Act final EIS and Record of Decision, provide programmatic guidance for DFPZ construction and maintenance in the HFQLG Pilot Project area. DFPZ maintenance methods were developed from criteria in the final supplement EIS involving land allocations, slope classes, and vegetation characteristics (see appendix D in this Slapjack Project EIS).

The final supplemental EIS and Record of Decision call for consideration of all practicable methods of vegetation control for site-specific projects, including the use of herbicides. As pointed out in the final supplemental EIS, herbicides have to be used within about two years of the initial treatment in order to be effective.

Alternatives B, E, and F propose the use of herbicides to treat approximately 1,954 acres of DFPZs where tanoak comprises more than 10 percent of the stand By not including the use of herbicides at this time for other units in the Slapjack Project, their use for DFPZ maintenance is essentially precluded. Under alternatives C and G, no herbicide use is proposed. If mastication does not achieve DFPZ objectives in all treatment units, an underburn would be used as a follow-up treatment to meet short-term objectives. In the long term, the foreseeable maintenance of the DFPZs would consist of prescribed fire, mechanical (mastication, grapple pulling), and hand treatments. Specific maintenance treatments would be determined based on site-specific analysis of land allocations, slopes, vegetation types, and previous underburning treatments.

About 25 percent of the proposed Slapjack DFPZ is in plantations. After the completion of the mastication proposed for these areas, manzanita, *Ceanothus*, and other shrub species could re-sprout and begin reducing DFPZ effectiveness within five years of the initial treatment. However, young shrubs, especially the *Ceanothus* species common in the area, have a high percentage of live material that maintains high fuel moisture content throughout the year. Younger shrubs are less flammable than older shrubs, since younger shrubs have a lower proportion of dead to live branches than older shrubs.

Ceanothus and other shrub species with high fuel moisture content can act as heat sinks. They can absorb some of the heat produced by adjacent burning fuels without igniting, thereby retarding fire spread. For example, the Mosquito fire in August 1999 started from a lightning strike adjacent to a nine-year-old plantation of primarily ponderosa pine with a high component of *Ceanothus* shrubs, much like many of the plantations in the Slapjack Project area. A fireline was quickly constructed through the middle of the plantation, and the fire was controlled at about 30 acres by one engine crew and a dozer. If the *Ceanothus* shrubs were older and contained more dead branches, the fire may not have been contained so easily or extinguished at 30 acres.

The remaining 80 percent of the project area is made up of more natural stands of larger sized trees, where the vegetation has not been as intensively treated. After completion of proposed thinning, biomass removal, mastication, and burning activities, some slow to moderate development of manzanita, *Ceanothus*, and other shrubs could occur, and in some areas, grasses would become more vigorous and dense. As the overstory canopy cover increases, suppression of shrub growth would begin and overall shrub cover would decrease. Since mastication would not change canopy cover levels, or only change them slightly, understory growth is expected to be least in these units. There would also be some natural regeneration of conifers over time. Conifer regeneration could reduce DFPZ effectiveness by creating fuel ladders within 10 to 20 years after the initial treatment, depending on the site.

Even if no maintenance is conducted in the DFPZs in the future, they should be effective for many years. In the natural stands, the DFPZs' effectiveness may not be seriously reduced for 10 to 20 years. In the plantations, the DFPZs' effectiveness may not be appreciably reduced for approximately 10 years. Even after that time, the DFPZs would retain many beneficial characteristics (such as increased overstory crown spacing and reduced ladder fuels) that would aid in fighting fire and reducing fire intensity. For example, the proposed action would remove a significant amount of ladder fuel, so even if significant amounts of understory vegetation grow in the treated stands over the next several years, the result would be a net loss in accumulated fuels. Additionally, Forest Service staff could conduct emergency maintenance and rapidly restore full effectiveness to the DFPZ in the event of an oncoming wildfire.

3.13 Wildlife and Fish

3.13.1 Introduction

This section presents a summary of the Biological Assessment / Biological Evaluation (BA/BE) for the Slapjack Project and includes complete discussions of possible effects of the proposed project and alternatives on federal Threatened and Endangered species, Proposed Candidate species, and Species of Concern; and Forest Service Sensitive species and Management Indicator Species (MIS). The BA/BE and MIS report (and appendices) are on file at the Feather River Ranger District office and available upon request.

Threatened and Endangered species – those species listed under the federal *Endangered Species Act*. Threatened species are likely to become endangered throughout all or a significant portion of their range (16 USC 1532). Endangered species are in danger of extinction throughout all or a significant portion of their range (16 United States Code [USC] 1532).

Proposed and Candidate species – a Proposed species is any species that is proposed in the *Federal Register* to be listed as a Threatened or Endangered species under the *Endangered Species Act* (50 CFR 402.03). A Candidate species is a candidate for listing as a Proposed species. The U.S. Fish and Wildlife Service recently changed its policy on Candidate species—the term "Candidate" now strictly refers to species for which the service has enough information on file to warrant or propose listing as Endangered or Threatened.

Federal Species of Concern – formerly referred to as "Candidate Category 2" species for which listing is possibly appropriate but for which the U.S. Fish and Wildlife Service lacks sufficient information to support a listing proposal. These are now called "Species of Concern" and are only analyzed if they are also listed as Forest Service Sensitive species.

Forest Service Sensitive species – those species, generally federal Candidates for listing or Species of Concern, that have been designated by the Forest Service as needing special management attention because of viability concerns. The Forest Service manages for these species to ensure they will not require listing as Threatened or Endangered.

Management Indicator Species – are used in project analysis because their population changes are believed to indicate whether management activities are having an effect on the viability and diversity of animal and plant communities. Table 3-54 lists MIS and Neotropical migratory birds (NTMB) species that potentially occur on the Plumas National Forest. There is no known habitat for, and there have been no observations of, the prairie falcon; therefore, this species is not discussed further in this document. The proposed activities in the Slapjack Project area may affect the habitat for MIS and Neotropical migratory bird species.

The possible effects on habitat for MIS are discussed in appendix A of the Slapjack Project BA/BE. Any effects on the MIS species are expected to be minimal and are therefore not discussed in detail in this section.

Table 3-54. MIS and Neotropical migratory bird species that potentially occur on the Plumas National Forest.

Species	Category
Swainson's thrush (*Catharus ustulatus*)	Neotropical Migratory Bird
Canada goose (*Branta canadensis*)	Management Indicator Species
Golden eagle (*Aquila chrysaetos*)	Management Indicator Species
Prairie falcon (*Falco mexicanus*)	Management Indicator Species
Woodpecker species	Management Indicator Species
Deer group	Management Indicator Species
Gray squirrel (*Sciurus griseus*)	Management Indicator Species
Willow/Alder group	Management Indicator Species
Trout (rainbow, brook and brown)	Management Indicator Species
Largemouth bass	Management Indicator Species

Table 3-55 lists the species for which habitat availability and suitability were considered for this project. The table includes determinations based on the analysis for the Slapjack Project as disclosed in the BA/BE, available data, and on the assumption that full implementation of identified mitigations would be in complete compliance with the 1988 *Plumas National Forest Land and Resource Management Plan* (commonly called the "Forest Plan"), as amended. The determinations are discussed in more detail below in the "Determinations" section (3.13.7).

Table 3-55. Status of federal Threatened, Endangered, and Candidate species and Species of Concern and Forest Service Sensitive species that potentially occur on the Plumas National Forest.

Species	Scientific Name	Category[a]	Summary of Effects[b]	
			No-Action Alternative	Action Alternatives
Carson wandering skipper	*Pseudocopaeodes eunus obscurus*	Endangered	WNA	WNA
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	Threatened	WNA	WNA
Fish				
Winter-run Chinook salmon	*Oncorhynchus tshawytscha*	Endangered	WNA	WNA
Central Valley steelhead	*Oncorhynchus mykiss*	Threatened	WNA	WNA
Delta smelt	*Hypomesus transpacificus*	Threatened	WNA	WNA
Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	Threatened	WNA	WNA
Central Valley spring-run Chinook salmon	*Oncorhynchus tshawytscha*	Threatened	WNA	WNA
Hardhead minnow	*Mylopharodon conocephalus*	Sensitive	WNA	MIS
Amphibians				
California red-legged frog	*Rana aurora draytonii*	Threatened	WNA	MAI
Foothill yellow-legged frog	*Rana boylii*	SOC/Sensitive	WNA	MAI

Table 3-55. Status of federal Threatened, Endangered, and Candidate species and Species of Concern and Forest Service Sensitive species that potentially occur on the Plumas National Forest (continued).

Species	Scientific Name	Category[a]	Summary of Effects[b]	
			No-Action Alternative	Action Alternatives
Amphibians (continued)				
Mountain yellow-legged frog	*Rana muscosa*	Candidate/ Sensitive	WNA	WNA
Northern leopard frog	*Rana pipiens*	Sensitive/MIS	WNA	WNA
Reptiles				
Northwestern pond turtle	*Clemmys marmorata marmorata*	SOC/Sensitive	WNA	MAI
Birds				
Bald eagle	*Haliaeetus leucocephalus*	Threatened/MIS	WNA	WNA
American peregrine falcon	*Falco peregrinus anatum*	SOC/Sensitive/ MIS	WNA	WNA
Northern goshawk	*Accipiter gentilis*	SOC/Sensitive/ MIS	WNA	MAI
California spotted owl	*Strix occidentalis occidentalis*	SOC/Sensitive/ MIS	WNA	MAI
Great gray owl	*Strix nebulosa*	Sensitive	WNA	WNA
Little willow flycatcher	*Empidonax trailii brewsteri*	SOC/Sensitive	WNA	WNA
Greater sandhill crane	*Grus canadensis tabida*	SOC/Sensitive	WNA	WNA
Swainson's hawk	*Buteo swainsoni*	SOC/Sensitive	WNA	WNA
Mammals				
Sierra Nevada red fox	*Vulpes vulpes necator*	SOC/Sensitive	WNA	WNA
Pacific fisher	*Martes pennant pacifica*	Candidate/ Sensitive	WNA	MAI
California wolverine	*Gulo gulo luteus*	SOC/Sensitive	WNA	WNA
Pallid bat	*Antrozous pallidus*	Sensitive	WNA	MAI
Townsend's big-eared bat	*Corynorhinus townsendii*	Sensitive	WNA	MAI
Western red bat	*Lasiurus blossevillii*	Sensitive	WNA	MAI

Notes:

a. SOC = Federal "Species of Concern"
MIS = Management Indicator Species

b. MAI = may affect individuals but not likely to result in a trend toward federal listing or loss of viability
WNA = will not affect.

The "Environmental Consequences" section below summarizes the potential effects of the proposed action alternatives on those species listed above in table 3-55 (see the Wildlife and Fish BA/BE for additional discussion of effects for these species).

Of the species listed in table 3-55, several were eliminated from detailed study in the BA/BE on the basis that (1) they are known to be found at much lower or higher elevations, or much further north or south of the project area; (2) suitable habitat is not found in the project area; and (3) surveys

in or near the project area did not locate any individuals. The following species were not analyzed in detail for the Slapjack Project BA/BE: Winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Delta smelt, Central Valley steelhead, Lahontan cutthroat trout, Sierra Nevada red fox, Carson wandering skipper, Valley elderberry longhorn beetle, Mountain yellow-legged frog, California wolverine, Northern leopard frog, Greater sandhill crane, American peregrine falcon, and Swainson's hawk.

3.13.2 Regulatory Framework

The 1988 Forest Plan provides specific information on the management of Threatened, Endangered, Proposed and Sensitive species on the Plumas National Forest. These include forestwide goals and policies for wildlife, fish, and sensitive plants (page 4-4); riparian areas (page 4-7); wildlife objectives (pages 4-14, 4-15, and 4-19); and forestwide direction and standards and guidelines for wildlife, fish, and sensitive plants (pages 4-29 through 4-35). Direction is also found under other areas (for example, timber management) that directly or indirectly affect animal species and/or their habitats. The management guidelines incorporate regional direction for each species.

The Forest Plan was amended by the HFQLG Act of 1999 and the Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS and Record of Decision. The guidelines required for compliance with the HFQLG Act EIS are listed in the BA/BE. The SNFPA Record of Decision provides implementation direction for the National Forests in the HFQLG Pilot Project area, consistent with the HFQLG Act and alternative B of the HFQLG Act final EIS. All action alternatives considered in this EIS for the Slapjack Project would comply with the SNFPA Record of Decision standards and guidelines (pages 68–69) and species-specific management direction.

Best Management Practices. As explained under "Hydrology" (section 3.8), the Forest Service, in consultation with the California State Water Resources Control Board, has developed Best Management Practices (BMPs) for control of water pollution on National Forest System lands. The BMPs are described in the *Water Quality Management for Forest System Lands in California – Best Management Practices* (USDA Forest Service 2000b) as they apply to DFPZ maintenance. All BMPs for timber management, vegetation manipulation, fire suppression and fuels management, roads, and watershed management apply at the site-specific project level (the watershed management BMPs include the use of herbicides). In addition, all site-specific DFPZ maintenance activities must meet the Forest Service Region 5's soil productivity standards (*FSH 2509.18 – Soil Management Handbook, R5 Supplement No. 2509.18-95-1*, effective June 11, 1995, as cited in the HFQLG Act final EIS).

Scientific Analysis Team Stream Protection Zone. The Scientific Analysis Team (SAT) developed viability assessments and management considerations, including stream protection zones, for species associated with late-successional old-growth forests in the Pacific Northwest (USDA 1993, as cited in the HFQLG Act final EIS). To protect riparian systems, SAT guidelines establish Riparian Habitat Conservation Areas (RHCAs) with "interim widths" buffers to all perennial and intermittent streams. The stream protection zone "interim widths" would be applied under all action alternatives. These interim widths and the Riparian Management Objective analysis are described in the "Hydrology Report" and the "Biological Assessment / Biological Evaluation for Wildlife and Fish."

3.13.3 Methodology for Assessing Impacts on Wildlife and Fish

3.13.3.1 Scope of the Analysis

The *analysis area for determining direct and indirect effects on terrestrial wildlife* is the proposed Slapjack Project boundary. The analysis area includes lands as much as 0.5 mile from the outer boundaries of the proposed treatment units (see the maps in appendix A of this document). Several of the 0.5-mile buffers around proposed treatments go beyond the project boundary onto private land and were not included as part of the survey. The Slapjack Project boundary is surrounded by private land and/or adjacent to other projects such as the Watdog, South Fork, and Sugarberry. The project area includes 22,939 acres of National Forest System land and 11,786 acres of private land for a total of 34,725 acres. The terrestrial wildlife analysis area was based on Forest Service lands surveyed to protocol for California spotted owls, northern goshawks, and other target species. The cumulative effects analysis area includes past, present, and reasonably foreseeable future projects occurring in and adjacent to the Slapjack Project analysis area. Past activities are considered part of the existing condition and are discussed in the "Affected Environment (Existing Conditions)" section for each resource.

The *aquatic/hydrologic analysis area* includes 42 subwatersheds ranging from 503 acres to 4,793 acres, with a total hydrologic analysis area of 66,247 acres of private and federal Lands. The amphibian, reptile, and fish species surveys were performed at various levels based on potential effects. The locations of the watersheds with respect to the proposed treatment units are depicted on figure 1 of the "Hydrology Report." The major watersheds in the hydrologic analysis area include McCabe Creek, Frey Creek, Lower Dry Creek, New Bullard's Bar Reservoir, Ponderosa Reservoir, and Dobbins Creek. The major rivers in the analysis area include the Middle Fork Feather River, South Fork Feather River, and North Yuba River. The Middle Fork Feather River and South Fork Feather River drain into Lake Oroville, the Feather River, and the various conveyances of the State Water Project. The North Yuba River drains into Bullard's Bar Reservoir, and Dry Creek drains into Lake Collins and Dry Creek. For a detailed description of the watersheds in the hydrologic analysis area, refer to table 1 of the "Hydrology Report."

3.13.3.2 Analysis Methods for Management Indicator Species

Management Indicator Species are used because their population changes are believed to indicate whether management activities are having an effect on the viability and diversity of animal and plant communities. A listing of MIS species (not including those species that are TES as well) and habitat rating can be found in table 3-40 (page 3-98) of the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) final environmental impact statement (EIS) (USDA Forest Service 1999a). That document indicates which MIS species could benefit from Pilot Project treatment activities, which species could experience a loss of habitat values, and which species' habitat value would remain the same. In the HFQLG Act final EIS (see table AA-3.25 in appendix AA), numerical California Wildlife Habitat Relationship (CWHR) values that existed prior to group selection harvest were compared to expected changes in habitat following group selection harvest. The comparison generated two sets of information when compared to current conditions: the comparative trend in habitat value (expressed here as the percent change in habitat value) and whether there are any changes in the habitat rating (low, moderate, or high). This information is also given for pre- and post-DFPZ construction. The Plumas National Forest MIS that are not federal TES species

are addressed individually in the Slapjack BA/BE appendices. The HFQLG Act final EIS and 2001 Sierra Nevada Forest Plan Amendment (SNFPA) final EIS and associated biological evaluations provide additional discussion concerning effects on the habitat for these species.

The mule deer analysis resulted in a positive habitat value trend and an increase from moderate to high habitat rating. The pileated woodpecker and gray squirrel analyses resulted in a negative habitat value trend, but the habitat rating remains moderate to high. The hairy woodpecker, golden eagle, and prairie falcon analyses resulted in a positive habitat value trend, and the habitat rating remains moderate to high. The trout group (rainbow trout), large-mouth bass, and Canada goose were not rated.

The golden eagle, gray squirrel, hairy woodpecker, and mule deer MIS are broad ranging, have a large forage base, can more easily escape disturbance, are more common, or are tree canopy foragers.

Neotropical migratory birds (NTMB) are of special concern because their breeding area includes the North American temperate zones, and in many cases, they will migrate south of the continental United States during nonbreeding seasons (Hunter et al. 1993). Due to their sensitivity to environmental change, NTMB species serve as an “early warning” system for alteration of ecosystem structure and function. By closely monitoring NTMB habitat associations and population trends within California habitats, the Forest Service can track the integrity and resilience of California ecosystems. These species are protected under the *Migratory Bird Treaty Act* (1918) based on their international importance. The list of Neotropical migratory birds within the California region is large and includes a broad number of habitat associations. The Breeding Bird Survey, coordinated by the U.S. Fish and Wildlife Service, indicates that certain populations of NTMB species in California have been declining over the past 26 years (1996 data). Habitat fragmentation and decreases in habitat quantity and quality, caused by changes in land use, seem to be largely responsible for the declines (Sherry and Holmes 1993; Terborgh 1992).

Saab and Rich (1997, as cited in the HFQLG Act final EIS) found that the NTMB species with decreasing population trends are likely those species that nest in shrub layers, and the species with increasing population trends tend to nest in tree canopies. There are 32 species of NTMBs that show population declines, and these species are associated with grassland, shrubland, open forest, or riparian habitat types.

In 1996 the Forest Service Region 5’s “Partners in Flight Program” group developed a list of “High-Priority Land Bird Species for Monitoring Efforts” for the Sierra Nevada bioregion. This list identified three species that are in the HFQLG Pilot Project area: great gray owl, willow flycatcher, and Swainson’s thrush. The great gray owl and willow flycatcher are Forest Service Sensitive species.

The overall effect of management activities on NTMB species populations has not been specifically studied, unless a species falls within the category of federal Threatened and Endangered or Forest Service Sensitive or MIS. However, the Forest Service has a legal mandate to provide habitat for viable populations of NTMBs. If any NTMBs were not well distributed or had viability concerns, they were included on the 1998 Forest Service Sensitive Species List, amended March 2001 and May 2003. Although current management guidelines ensure that habitat will be protected for these species, the presence of suitable habitat does not necessarily mean these species are present in that habitat.

In certain cases, habitat modification would be expected to affect some NTMB species more than others. The effects of timber harvest, road construction, hand treatments, and pile burning would include but are not limited to (1) mortality of young in the nest that are too young to escape activities, or when adults abandon nests due to disturbance; and (2) loss of nesting, roosting, or foraging habitat.

3.13.3.3 Analysis Methods for Threatened and Endangered and Sensitive Species that Occur in the Project Area

The survey status and protocol are described below for those Threatened and Endangered species with a determination of "may affect individuals but not likely to result in a trend toward federal listing or loss of viability."

California Red-Legged and Foothill Yellow-Legged Frogs. There are numerous observations of foothill yellow-legged frogs distributed across the Feather River Ranger District. Reproductive success of these populations is unknown; however, sightings have been noticeably concentrated along the lower portion of the South Fork Feather River, Onion Creek, Slate Creek, and Flea Valley Creek, suggesting localized breeding success.

Currently, the only known red-legged frog population in the Slapjack Project area is in the Dobbins Creek watershed. The two frog species were not located during 1997 surveys conducted as part of a proposed land exchange project in Little Oregon, Burnt Bridge, Cottage, and Dobbins Creeks (USDA Forest Service 1999b). Following the 1999 Pendola fire, surveys were conducted in 2000 by the Forest Service in the same creeks, and populations of California red-legged frogs were found at two different ponds in the Slapjack Project area. Every year since the initial detections in 2000, surveys have been conducted, and frogs have been consistently observed in the two ponds. Habitat assessments and species surveys were completed in 2001 and 2003 at the Dobbins Creek watershed, and California red-legged frogs were found. More ponds were discovered north of Dobbins Creek, and most of those ponds are suitable for the frogs. The ponds were surveyed several times in August 2003, but no California red-legged frogs were observed during the visits. Other potential suitable habitat in the project area was identified in Cottage Creek.

Klamath Wildlife Resources completed amphibian surveys in the Slapjack Project area in 2004 using "A Standard Protocol for Surveying Aquatic Amphibians" (Fellers and Freel 1995), as well as "Field Surveys for California Red-legged Frog" (a guide issued by the U.S. Fish and Wildlife Service) as the guiding protocols for their surveys. The four survey sites chosen for the California red-legged frog (*Rana aurora*) were selected based on the best available habitat. No California red-legged frog (*Rana aurora* or *Rana draytonii*) individuals were found at the sites (KWR 2004), and none were found in part of a survey area that is less than a mile from the known site to the north.

California Spotted Owl. The Forest Service has conducted project-related surveys at various levels for the California spotted owl since the 1989 field season. Protocol-level surveys for the owl were completed in 2003, 2004, and 2005 for the Slapjack Project analysis area. Most owl observations were associated with established Protected Activity Centers. Surveys followed the "Protocol for Surveying for Spotted Owls in Proposed Management Activity Areas and Habitat Conservation Areas" (Forest Service Region 5, March 12, 1991; revised February 1993). There are currently eight Protected Activity Centers. There have been up to seven pairs and seven successfully

fledged young over the past three years. There are 13,317 acres classified as suitable nesting and 7,886 acres classified as suitable foraging habitat within the project boundary.

Northern Goshawk. Surveys followed the "Survey Methodology for Northern Goshawks in the Pacific Southwest Region" (Forest Service Region 5, May 14, 2002). Northern goshawks were not sighted in the Slapjack Project boundary during surveys conducted between 2004 and 2005. The lack of detections is possibly due to factors such as a low productivity years and a dense understory. Although the habitat in the project boundary was generally excellent, it did not appear extensive enough to sustain nesting pairs of northern goshawk. According to the surveyors, much of the private land bordering the project area had been either heavily harvested or at least thinned, with the old-growth component removed. There are no established northern goshawk Protected Activity Centers in the Slapjack Project analysis area. There are 8,503 acres classified as suitable nesting and 11,753 acres classified as suitable foraging habitat in the project boundary.

Great Gray Owl. Great gray owl surveys were completed in the analysis area in 2005. Surveys followed the "Survey Protocol for the Great Gray Owl in the Sierra Nevada of California" (Beck and Winter 2000). There have been no observations of this species reported in the Slapjack Project analysis area. The contract surveyor reported that some of the meadows surveyed in the project analysis area provide potential habitat. The closest recent observation (2004) of a great gray owl occurred approximately 6 miles north of the analysis area boundary around Pinchard Creek.

Northwestern Pond Turtle. Northwestern pond turtles were found in a pond near the town of Feather Falls during surveys completed in 2004. The surveys followed "Western Pond Turtle Survey Methods" as the guiding protocol. Ponds were surveyed to protocol based on the best available habitat. In 2003 Forest Service personnel located northwestern pond turtles at Hampshire Creek, but the turtles were not found during the 2004 surveys. Forest Service personnel have reported other sightings during 2004 and 2005.

Pallid, Western Red, and Townsend's Big-eared Bat. Surveys followed an interim protocol approved by Forest Service Region 5. Bat surveys were conducted in 2001 and 2002 for several HFQLG Act Pilot Projects, including Upper Slate DFPZ, Lower Slate DFPZ, South Fork DFPZ, Bald Onion DFPZ, Brush Creek DFPZ, and Watdog DFPZ. No surveys have been conducted in the Slapjack Project area. See the "Environmental Consequences" section below for habitat effects on pallid, western red, and Townsend's big-eared bats. If bats are found at a later date, appropriate management requirements would be applied before implementation of DFPZ treatments or group selection in the Slapjack Project area. There are 19,904 acres classified as suitable nesting and 4,549 acres classified as suitable foraging habitat in the project boundary.

Little Willow Flycatcher. Surveys followed "A Little Willow Flycatcher Survey Protocol for California" (Bombay, Benson, and Valentine 2003). Surveys from 2004 through 2005 were limited to areas with historical observations and potentially suitable habitat. Although no little willow flycatchers have been observed in the Slapjack Project area, potential habitat could occur in the Riparian Habitat Conservation Areas. If nesting little willow flycatchers are found at a later date, appropriate protection measures would be applied before implementation of proposed project treatments.

Pacific Fisher. The Pacific fisher has the potential to occur on the Plumas National Forest, although it was not detected during surveys completed in the winter of 2004. Potential sites were assessed using on-the-ground habitat typing or topographical maps and aerial photos. Some of the proposed treatment units do contain suitable habitat.

Hardhead Minnow. Surveys have not been conducted for hardhead minnows for the Slap Jack Project. Known and suspected distributions of hardhead minnows are found in the Forest Fisheries GIS layer, atlases, and stream files. Hardhead minnow are known to occur in the following subwatersheds of the analysis area: subwatersheds 1, 2, 4, 6, 8, 10, 11, 23, 27, 30, 33, 34, 40, 41, and 42. Hardhead minnow populations are suspected in subwatersheds 5, 7, 29, 31, 32, 36, 38, and 39. Subwatershed locations are shown on figure 3-4 in section 3.8, Hydrology.

In addition fish population studies have been conducted by California Department of Fish and Game and Department of Water Resources. The project is within the boundaries of the South Fork Feather Project area (FERC project no. 2088), and numerous consultants have completed studies for the relicensing and monitoring of waters within the hydroelectric project (South Fork Feather Water and Power Agency 2005). Habitat suitability was determined by knowledge of the stream drainage characteristics and review of these FERC relicensing habitat mapping studies. The Cumulative Watershed Effects Analysis for the Slapjack Project was used extensively to determine those watersheds with Sensitive species in the hydrological analysis area that were at the Threshold of Concern or would be impacted by the proposed actions. In addition, the analysis conducted for the 2003 HFQLG Act final supplemental EIS and BA/BE was also used to analyze the effects of the use of herbicides on aquatic species.

3.13.3.4 Herbicide Hazard Analysis

A summary for the herbicide hazard analysis is provided below; for a detailed explanation of the herbicide hazard analysis, refer to appendix K of the Slapjack Project BA/BE.

Wildlife may be exposed to herbicides if they are in the vicinity of contaminated surface waters and terrestrial habitats. The routes of exposure include oral, dermal, and inhalation. Oral exposures might occur through ingestion of contaminated food or water or incidental ingestion of contaminated media during foraging or other activities. Dermal exposures are likely to be most important for burrowing mammals (through contact with contaminated soils) and animals that spend considerable amounts of time submerged in surface waters. The effects of inhalation exposures are limited to three studies performed on rats. The results of the studies have been submitted to the U.S. Environmental Protection Agency (EPA) as part of the herbicide registration process. No toxic effects were observed in a four-hour exposure to either imazapyr or imazapyr formulations in aerosol concentrations of 75 mg/L (milligrams per liter) (People 1984)

The appendices and the project file for the HFQLG Act final supplemental EIS contain detailed information about herbicide exposure factors and the methodology for calculating potential exposures in animals. The major factors used in that EIS are displayed in table 3-56.

Table 3-56. Wildlife herbicide exposure factors.

Parameter Type	Exposure Route / Factor Category	Factor
Normalizing Factors	Oral	Body weight
		Metabolic rate
		Food ingestion rate
		Dietary composition
		Water ingestion rate
Contact Rates	Dermal	Surface area[a]

Source: EPA/600/R-93/187; December 1993.

Oral Exposure. Three environmental media are the primary contributors to oral exposure to wildlife: food, water, and soils and sediments. Four contact rate exposure parameters related to these three exposure media are metabolic rate, food ingestion rate, dietary composition, and water ingestion. For a complete discussion of contact rates and exposure parameters, refer to appendix K in the Slapjack Project BA/BE. The body weight of animals is used to calculate the "potential dose to animal." Appendix F in the HFQLG Act final EIS provides a more detailed discussion of how animal body weight factors into these calculations. For dermal exposure rate calculations refer to appendix K in the BA/BE.

Dermal Exposure. Dermal contact with contaminated soil, vegetation, sediment, or water can be an exposure pathway for some wildlife species. An animal's surface area may be used to estimate the potential for uptake of contaminants through the skin. For some exposures (such as dust bathing), the entire surface area of the animal may be important. For other types of exposures (such as swimming), only the non-insulated portions (portions of the body's surface with no fur or feathers that create a trapped air layer) of the animal may contact the contaminated medium. The skin does provide a certain degree of protection from external chemicals, and the relative absorption of chemicals must be considered to determine realistic dose levels. In this analysis, several of the exposure scenarios assume that the skin affords no protection at all, equaling 100 percent absorption.

Inhalation Exposure. As stated above, the results of the studies on rats have been submitted to the U.S. Environmental Protection Agency (EPA) as part of the herbicide registration process. No toxic effects where observed in a four-hour exposure to either imazapyr or imazapyr formulations of aerosol concentrations (People 1984).

Effects on Surrogate Species. A common technique in assessing the effects of herbicide use is by surrogate species. In the context of testing various chemicals, surrogate species are typically organisms that are easily tested using standardized methods. However, these species may not represent populations of federally listed Endangered and Threatened species. The wide use of pesticides and other commercial chemicals potentially pose a risk to Endangered and Threatened species since, by definition, the distribution of listed species is limited, and further adverse effects on these populations could lead to extinction (Dwyer 1997).

Herbicides and surfactant and surrogate species – It is important to note that a certain amount of caution should to be taken when addressing ecological risk and the use of surrogates when analyzing

risk. The use of an interspecies extrapolation factor in ecological risk assessment has been discussed by a variety of authors (Calabrese et al. 1993). Numerous attempts have been made to assess the occurrence and magnitude of interspecies variation in response to ecological toxicants, especially within the aquatic environment (Calabrese et al. 1993). Slooff et al. (1986) found a positive correlation in interspecies relationships in response to toxic agents, with somewhat higher correlations being observed for species within the same phylogenetic (based on natural evolutionary relationships) groupings compared to taxonomically distant species. Barnthouse et al. (1990) recognized that [toxicity] data indicated the extent of taxonomic variation is similar for the "species within genus" and the "genera within family" categories. However, the phylogenetic relatedness diminishes when one considers "families within orders" and "orders within class," with the size of uncertainty factors increasing appreciably. Additional intraspecies and interspecies extrapolation assessments (Abt. Associates 1995; Kooijman 1987; Dourson et al. 1983) showed similar phylogenetic relationships. For example, it is best to compare toxicological effects on bat surrogates to bats; less comparable to compare bats to mice, and even less comparable to compare bats to birds.

Sappington et al. (2001) actually tested specific federally listed species for contaminate sensitivity compared to standard surrogate species. The resulting data appears to be contradictory and unclear. Sappington et al. (2001) did infer that in some cases, certain listed species were more sensitive than the representative surrogate species. Again, much of the testing and findings have been within the aquatic environment. Although the level of uncertainty in the terrestrial environment may be highly variable, it is being assumed in this document that these phylogenetic relationships are valid. In a *Critical Evaluation of Safety (Uncertainty) Factors for Ecological Risk Assessment*, Chapman et al. (1998) noted that "some extrapolations appear to work better than others, but none are perfect." Refer to the "Human Health" section in appendix C of the HFQLG Act final EIS BA/BE for discussions on effects of inert ingredients.

Adjuvants – These are additives that are mixed with herbicide spray solutions to improve performance of the spray mixture. Adjuvants can either enhance the activity of an herbicide's active ingredient (activator adjuvant) or offset any problems associated with spray application, such as adverse water quality or wind conditions. Activator adjuvants include surfactants, wetting agents, sticker-spreaders, and penetrates.

Adjuvants are not under the same registration guidelines as are pesticides. The EPA does not register or approve the labeling of spray adjuvants, although the California Department of Pesticide Regulation does require the registration of adjuvants that are considered to increase the action of the pesticide it is used with. The manufacturers generally field test all adjuvants with several different herbicides against many weeds and under different environments.

Active Ingredient and Surrogate Species. The following describes the current information on the effects of the two proposed herbicides (imazapyr and triclopyr) and surfactants on a variety of species considered as surrogates in this document. As with any assessment, risk must be qualified by the general reservations for the risk assessment: the absolute safety cannot be proven, and the absence of risk can never be demonstrated. The herbicides and surfactant ingredients have been tested in only a limited number of species and under conditions that may not well-represent populations of free-ranging nontarget animals or some populations of nontarget plants. The far majority of information available was on experiments conducted on particular animals in laboratory environments. While

laboratory experiments can be used to determine such factors as acute toxicity, reproductive risk, neurotoxic risk, and immunotoxic risk that must be considered, laboratory experiments do not account for wildlife in their natural environments. Those factors can adversely affect wildlife health by causing lethargy, weight loss, nausea, and fluid loss due to diarrhea or vomiting. These health issues affect the animal's ability to compete for food, locate and/or capture food, avoid or fight off predators, or reproduce, which may potentially lead to mortality.

The BA/BE for the HFQLG Act final supplemental EIS (page 112 and page 173) illustrates a wide range of exposure scenarios for avian, mammal, and fish test species and looks at only the typical application rates at the highest exposure levels for each of the two herbicides and surfactants. An assumption was made that the exposure scenario would be representative of the effects on wildlife species considered in the BA/BE.

The effects of herbicides as they relate to individual species are discussed in this "Wildlife" section under direct and indirect effects. The effects of herbicide use have been fully evaluated; however, there is a vast amount of information regarding herbicides use that cannot be summarized completely in this document.

3.13.4 Affected Environment (Existing Conditions)

The proposed treatments in the Slapjack Project area would avoid California spotted owl and northern goshawk Protected Activity Centers, Spotted Owl Habitat Areas (RHCAs), and Pacific fisher den sites. In the Defensible Fuel Profile Zone (DFPZ) units, treatment in the RHCAs would be limited to underburning, hand piling, and hand thinning, except in some plantation where mechanical treatment (mastication) is prescribed. The group selection harvest units would avoid RHCAs. In the DFPZ treatment areas, RHCAs in plantations and brushfields are to be treated to improve riparian habitat conditions (see appendix G in the Wildlife and Fish BA/BE).

The Slapjack Project hydrologic analysis area contains a high road density. The density of roads near streams and stream crossing density are problems in the watershed area under the existing condition. Roads modify drainage networks and accelerate erosion processes, resulting in the alteration of physical processes in streams. These changes can be dramatic and long lasting and can degrade water quality and aquatic habitat (see the "Hydrology Report" in the project file).

The "Hydrology Report" provides the road densities of each subwatershed, and the majority of the watersheds have a road density that does not meet the desired condition for minimizing road impacts on aquatic and riparian environments (USDA Forest Service 2003a).

3.13.4.1 Terrestrial Habitat

The Forest types in the low reaches of the project area include Montane hardwoods (incense-cedar) [*Calocedrus decurrens*], California black oak [*Quercus kelloggii*], tanoak [*Lithocarpus densiflorus*], and Pacific madrone [*Arbutus menziesii*]. The forest types at the highest elevation of the project area include Sierra mixed conifers, Ponderosa pine [*Pinus ponderosa*], Douglas-fir [*Pseudotsuga menziesii*], and sugar pine [*Pinus lambertiana*]. The understory vegetation includes poison oak, blackberry, whitethorn, tanoak, and manzanita. There are some wet meadows scattered

throughout the project area that contain a large amount of structural diversity, with conifers, manzanita, and *Ceanothus* in or near wet areas. The existing condition of the meadows ranges from good to adversely affected, depending on meadow location and past restoration activities that have been accomplished. The types of adverse effects include invasion of meadows by conifers due to lack of natural fire regime and/or disturbance from past logging practices, soil erosion from roads, season-long cattle grazing, and vehicles being driven into meadows. These disturbances have contributed to stream destabilization in the meadows (see the "Hydrology Report").

Terrestrial habitat elements that are of particular importance for wildlife include large trees, snags, hardwoods, and large woody debris. Large trees, and the snags they produce, have been found to be critically important for the California spotted owl, northern goshawk, Pacific fisher, and American marten. Snags, particularly large ones (greater than 24 inches diameter at breast height [dbh]), are an important wildlife habitat component of forested stands. The snags provide habitat for primary cavity nesters (such as woodpeckers), secondary cavity nesters (such as flying squirrels), and some Neotropical migratory birds (including the mountain bluebird, violet-green swallow, Vaux's swift, and American kestrel). Snags are also the main source of large woody debris. Past management practices, including logging, firewood cutting, road construction, and other activities, have probably led to a decline in the number of large-diameter trees and snags in the project area (with a detrimental effect on associated wildlife species), which is an essential habitat component for several old-forest-associated species such as the California spotted owl, northern goshawk, and Pacific fisher.

Individual oaks and oak communities profoundly affect the variety and abundance of wildlife. Oak leaves, twigs, roots, pollen, wood, and sap are sustenance for numerous insects, birds, and mammals. Insects (such as aphids, whiteflies, mites, and leafhoppers) suck sap from leaves and tender shoots. Reptiles, amphibians, and bats do not consume oaks but prey heavily on the insects that do. Acorns from oaks and berries from Pacific madrone serve as valuable food due to the large amounts produced and their high nutrient content and, also, because they are available at critical times of the year (McDonald et al. 1995). Some vertebrates (such as bear, deer, squirrels, and woodrats) depend on the nutritious acorn crop for food. While food is a primary resource produced by oaks, of greater overall significance is the fact that oaks contain nooks, crannies, perches, and passages where animals live, breed, and rest. They also provide nest sites for the arboreal species, such as the northern flying squirrel, that use tree cavities. The physical structure of oak communities determines the availability of shelter, nesting sites, and corridors for travel. Wildlife use oaks as places to hide, shade, and escape from predators and from fires (Pavlik et al. 1991).

3.13.4.2 Riparian Habitat

Riparian habitats support a greater diversity and abundance of wildlife than most other cover types. These areas function as habitat for vertebrate wildlife and provide corridors for wildlife movement and migration. They act as wildlife refuges during wildfires, and stream sides are often the first areas that wildlife will re-occupy after stand-replacing fire events. Dense and diverse riparian vegetation provides a large variety and quantity of nest and perch sites, along with food from seeds, fruits, and insects. This habitat supports many bird, mammal, reptile, and amphibian species. There are 549 miles of streams in the analysis area for aquatic species. The watersheds include McCabe, Frey, Lower Dry Creek, New Bullard's Bar Reservoir, Ponderosa Reservoir, and Dobbins.

Hampshire Creek Meadow is a unique riparian habitat. The two ponds in this meadow provide habitat for the northwestern pond turtle, a Sensitive species / Species of Concern.

3.13.5 Environmental Consequences

The treatments proposed for the Slapjack Project would avoid California spotted owl and northern goshawk Protected Activity Centers (PACs), Spotted Owl Habitat Areas, and American marten and Pacific fisher den sites. Treatments in the Riparian Habitat Conservation Areas (RHCAs) would be limited. In DFPZ units, treatment in the RHCAs would be limited to underburning, hand piling, and hand thinning, except in some plantations where mechanical treatment (mastication) is prescribed near ephemeral streams. Group selection would avoid RHCAs. Refer to the "Hydrology" section (3.8) in this EIS for more discussion about the proposed treatments in RHCAs.

All action alternatives propose DFPZ, individual tree selection, and group selection treatment methods as described for alternative B in "Chapter 2: Alternatives." The action alternatives differ by the number of acres of group selection harvest treatments or by the method of DFPZ maintenance or noxious weed control. The canopy cover and diameter limits are the same for all action alternatives, as are the wildlife, aquatic, and riparian ecosystem restoration activities. All acreages are derived from a Geographic Information System; acreages have been rounded and are subject to change based on data collection using a Global Positioning System.

3.13.5.1 Alternative A (No Action)

The effects of alternative A apply to all species considered in this document. As required by Council on Environmental Quality regulations (40 CFR 1502.14(d)), the effects of alternative A are described in this document because, as the no-action alternative, it serves as a baseline for comparison of the effects of the action alternative.

No DFPZs would be constructed and no group selection or individual tree selection would be implemented under the no-action alternative. The activities that would have the potential to improve fisheries habitat (such as aquatic species passage, streambank stabilization, meadow restoration, and road decommissioning) would not be conducted under alternative A.

Under this alternative, forest conditions would continue to change in response to natural and human factors. Due to past fire exclusion, an understory of ground vegetation (which includes poison oak, blackberry, whitethorn, tanoak, and manzanita) has developed beneath the overstory. This has created a multistoried stand with moderate to dense canopy closure that currently ranges from 31 to 90 percent in California Wildlife Habitat Relationship (CWHR) size class 4 and 5 stands. The cover from trees less than 6 inches dbh does not count toward canopy for CWHR. The encroachment of conifers on riparian areas and meadows would gradually increase. Conifers are overtopping black oak in some areas. More so than under the proposed action alternatives, wildfire could cause substantial losses of forest cover, resulting in degraded watersheds and wildlife habitat. Insect attack could cause tree mortality, thereby increasing fire hazard. No fuel-reduction or restoration opportunities would be implemented.

By not implementing the Slapjack Project, the main transportation roads in the area would remain in a less-than-satisfactory condition, allowing poor road access for the public and fire management to persist in some areas. Roads in good condition provide access for emergency response, woodcutting, mining, sightseeing, and other recreational activities. Roads not closed or decommissioned would continue to contribute to accelerating erosion processes, which would alter water quality and aquatic habitat and increase cumulative watershed effects.

The existing fuel loads left by this alternative would make potential wildfires in the area difficult to suppress and would create a more intense burn, which could lead to increased rates of spread and result in additional acres burned. Given that fire history records for the period 1917 to 2003 show a total of 58 fires have occurred in and near the proposed Slapjack Project area, it is likely that National Forest System lands would burn again and threaten the recovered upland and aquatic habitats. Any additional acres burned at high intensity could contribute to habitat loss and increased sedimentation, which would adversely affect the habitat required by Threatened, Endangered, Proposed, and Sensitive species and MIS species (Rotta 2002). The historical fire regimes are described by a five-tiered system that ranks fire regimes by frequency and severity. Historically, the Slapjack Project area is considered to be a Fire Regime 1, Condition Class 3. Through the absence of fire, this has changed to a Fire Regime 4, Condition Class 3 (see section 3.5 in this EIS and the “Fire and Fuels Report” in the project record).

California Red-legged Frog

Direct Effects. There would be no direct effects on California red-legged frogs because no activities would occur to create disturbance to individual California red-legged frog or result in any impacts on the existing habitat conditions.

Indirect Effects. The indirect effects of the no-action alternative include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn. This could lead to increased rates of spread, resulting in potential loss of Riparian Habitat Conservation Areas (RHCAs) and suitable California red-legged frog habitat. Any acres burnt at high intensity could contribute to increased sedimentation, which would adversely affect aquatic habitats and potential breeding habitat for the California red-legged frog. Herbicide application, which could affect breeding or disperse frogs and/or their prey base, would not occur.

Cumulative Effects. The no-action alternative for the Slapjack Project would not protect California red-legged frog habitat. There would be no actions designed to reduce the risk of high-intensity wildfire. There is the potential for the RHCAs to act like chimneys and carry fire up and down the watershed. There would be no fuel reduction projects; hence, watershed restoration would not occur to protect watersheds from catastrophic wildfire. Cumulative effects from private land use (gravel extraction, livestock grazing, and urbanization) would continue to create water quality problems, including sedimentation and bank cutting.

Northwestern Pond Turtle

Direct Effects. There would be no direct effects on western pond turtles or their habitat because no activities would occur that could cause disturbance to individual turtles or impact existing habitat conditions.

Indirect Effects. The indirect effects of no-action would include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress, creating a more intense burn and leading to increased rates of spread. This could result in potential loss of RHCAs and suitable western pond turtle habitat. Any acres burnt at high intensity could contribute to increased sedimentation, which would adversely affect aquatic habitats and potential breeding habitat for the western pond turtle. Herbicide application, which could affect breeding or dispersing turtles and/or their prey base, would not occur.

Cumulative Effects. The no-action alternative for the Slapjack Project would not protect or enhance western pond turtle habitat. There would be no actions designed to reduce the risk of high-intensity wildfire. Watershed restoration through these fuel reduction projects would not occur to protect the sensitive watersheds from catastrophic wildfire.

Bald Eagle

Direct Effects. There would be no direct effect on individuals as a result of implementing the no-action alternative. There are no bald eagle territories or bald eagle management areas in the Slapjack Project or wildlife analysis area.

Indirect Effects. There would be no changes in the fishery production within Bullard's Bar Reservoir because there would be no fuel treatments or group selection and individual tree selection harvests. Implementation of BMPs, and meeting all Riparian Management Objectives (the RMO analysis is located in project record), would ensure that that there would be no indirect effects on the fisheries or fisheries habitat. Herbicide application would not occur under alternative A, so there would be no effects on eagles and/or their prey base.

Cumulative Effects. Under the no-action alternative, no treatment activities would occur, so there would be no direct or indirect effects on known bald eagle territories or bald eagle management areas on the Plumas National Forest, no direct or indirect effects on known winter roosts on the Forest, and no direct or indirect effects on foraging habitat on the Forest. Because of this, the Slapjack Project would not contribute to cumulative effects on bald eagles or bald eagle habitat. None of the 21 bald eagle territories on the Plumas National Forest would be affected by this project.

California Spotted Owl

Direct Effects. Without fuels treatments, the no-action alternative would allow succession to continue, which would result in denser stand conditions, thus reducing the amount of fragmentation within the area of connectivity between the California spotted owl and northern spotted owl. As succession continues, natural stand processes would enhance the complexity of the untreated forest stands and potentially improve both roosting and nesting characteristics. In addition, it would enhance

foraging habitat by providing denser, more diverse stand conditions conducive to California spotted owl and/or their prey species. This could lead to an increase in the number of Home Core Range Areas that have greater than 50 percent suitable habitat.

The closed-canopy old-growth stands are favored by California spotted owls and are less flammable because the dense canopies maintain higher relative humidity within the stands and reduce heating and drying on surface fuels by solar radiation and wind.

Over the long-term, forest vegetation would continue to grow, increasing canopy cover of dominant and codominant trees. Mortality in intermediate and suppressed trees would increase, resulting in more snags and dead and down logs. These changes would benefit species such as the California spotted owl, northern goshawk, and forest carnivores, which are associated with late-successional forests. However, these long-term changes in forest structure could lead to an increase in fuel hazards and increase the probability of a stand-replacing fire in the future. The loss of late-successional forests to fire could eliminate habitat for species associated with these forest types. The high-elevation, abnormally dry forest types, such as in the immediate project area, have been altered as a result of past logging, livestock grazing, and fire suppression. These forests have become so dense with smaller trees and brush that fire cannot be safely or successfully reintroduced without first reducing fuel loads. The dense understory makes it difficult for owls to hunt; on the other hand, the dense components provide a diversity of prey for the owl. Initially, prey may diminish but would eventually return and flourish. In overly dense stands, thinning some of the smaller trees from below the tree canopy could potentially facilitate fire's natural return, thereby improving forest ecosystem health.

Indirect Effects. There would be no maintenance activities occurring under alternative A, so there would be no behavioral disturbances to the roosting nest. There would be no herbicide applications occurring that could affect owls and/or their prey base. Snags and down woody material, including large logs, would continue to accumulate, contributing to habitat diversity. On the contrary, wildlife hazard would continue to be a threat to habitat loss.

Cumulative Effects. The no-action alternative would not provide for the long-term protection of California spotted owl habitat from catastrophic fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on the analysis conducted for the SNFPA final EIS (2001). There would be no thinning that could enhance the growth of dominant and codominant trees that may provide future habitat availability.

Northern Goshawk

Direct Effects. There would be no direct effects on goshawk or goshawk habitat because no activities would occur that could cause disturbance to nesting or foraging birds or impact existing habitat conditions.

Indirect Effects. The indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which

could lead to increased rates of spread. This would result in potential loss of suitable goshawk nesting habitat and other important prey habitat attributes such as large trees, large snags, and down woody material. The proposed treatments of thinning out the understory could create or improve habitat available for nesting and foraging.

Cumulative Effects. The no-action alternative would not provide for the long-term protection of goshawk habitat from catastrophic fire. There would be no actions designed to reduce the risk of high-intensity wildfire. The total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on the analysis conducted for the SNFPA final EIS (2001). There would be no thinning to enhance the growth of dominant and codominant trees that may provide future habitat availability.

Pacific Fisher

Direct Effects. There would be no direct effects on forest carnivore habitat because no activities would occur that could cause disturbance to denning, resting, dispersing, or foraging animals or impact existing habitat conditions.

Indirect Effects. The indirect effects of taking no action would include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread. This would result in potential loss of suitable forest carnivore habitat and other important prey habitat attributes such as large trees, large snags, and down woody material.

Under the current Plumas National Forest woodcutting program, the entire project area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use in areas used by marten, especially during the denning season, may cause disturbance that could disrupt and preclude successful denning. Herbicide application, which could affect fishers and/or their prey base, would not occur.

Cumulative Effects. The no-action alternative would not provide for the long-term protection of forest carnivore habitat from catastrophic fire, and there would be no actions designed to reduce the risk of high-intensity wildfire. The total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on the analysis conducted for the SNFPA final EIS (2001). There would be no thinning that could enhance the growth of dominant and codominant trees that may provide future habitat availability.

Pallid, Western Red, and Townsend's Big-Eared Bat

Direct Effects. There would be no direct effects on bats or bat habitat because no activities would occur that could cause disturbance to denning bats or impact existing habitat conditions.

Indirect Effects. The indirect effects of taking no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense

burn, which could lead to increased rates of spread. This could result in potential modification of suitable bat habitat, including the loss of large trees, large snags, and down woody material.

Uncontrolled public use in the areas used by bats, especially during the breeding season, may cause disturbance that could disrupt and preclude successful recruitment of young. Herbicide application, which could affect bats and/or their prey base, would not occur.

Cumulative Effects. The no-action alternative would not provide for the long-term management of bat habitat from being greatly altered by a catastrophic fire. There would be no actions designed to reduce the risk of high-intensity wildfire. There would be no thinning that could enhance the growth of dominant and codominant trees that may provide future habitat availability.

Little Willow Flycatcher

Direct Effects. There would be no direct effects on little willow flycatcher or little willow flycatcher habitat because no activities would occur that could cause disturbance to nesting or foraging birds or impact existing habitat conditions.

Indirect Effects. The indirect effects of taking no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread. This could result in potential loss of suitable little willow flycatcher nesting habitat and other important prey habitat attributes. Herbicide application, which could affect little willow flycatchers and/or their prey base, would not occur.

Uncontrolled public use in the areas used by the little willow flycatcher, especially during the nesting season, may cause disturbance that could disrupt and preclude successful nesting.

Cumulative Effects. The no-action alternative would not provide for the long-term protection of little willow flycatcher habitat from catastrophic fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on the analysis conducted in the SNFPA final EIS (2001). There would be no thinning that could enhance the growth of dominant and codominant trees that may provide future habitat availability.

Great Gray Owl

Direct Effects. There would be no direct effects on great gray owl or great gray owl habitat because no activities would occur that could cause disturbance to nesting or foraging birds or impact existing habitat conditions.

Indirect Effects. The indirect effects of taking no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread. This could result in potential loss of suitable great gray owl nesting habitat and other important prey habitat attributes such as large trees, large snags,

and down woody material. Herbicide application, which could affect owls and/or their prey base, would not occur.

Cumulative Effects. The no-action alternative would not provide for the long-term protection of great gray owl habitat from catastrophic fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on the analysis conducted in the SNFPA final EIS (2001). There would be no thinning that could enhance the growth of dominant and codominant trees that may provide future habitat availability.

Hardhead Minnow

Direct Effects. There would be no direct effects on hardhead minnow or their habitat because no activities would occur that could cause disturbance to individual hardhead minnows or impact existing habitat conditions. There would be no direct effects on hardhead minnows and MIS fish species habitat because no activities would occur that could cause disturbance to these species.

Indirect Effects. No roads would be closed or decommissioned under the no-action alternative; therefore, the roads would continue to contribute to accelerating erosion processes, affecting hardhead minnow and MIS trout species by altering water quality and aquatic habitat and increasing cumulative watershed effects.

The potential increase in catastrophic fire, loss of upland and riparian vegetation, and increase in hill slope runoff could lead to increased sedimentation and decreased water quality. This could adversely affect downstream hardhead minnow and MIS trout rearing, holding, and spawning habitat. There is potential for minimal indirect effects on hardhead minnow and MIS fish species habitat.

Cumulative Effects. The no-action alternative would not protect riparian corridors and adjacent stream channels; thus, hardhead minnow and MIS trout species habitat would not be protected. There would be no actions designed to reduce the risk of high-intensity wildfire. There is the potential for RHCAs to act like chimneys and carry fire up and down the watershed. Cumulative effects from private land use (gravel extraction, livestock grazing, and urbanization) would continue to create water quality problems, including sedimentation and bank cutting; because of this, cumulative effects are expected.

3.13.5.2 All Action Alternatives: General Habitat Effects

Structural complexity, which is comprised of late-successional growth, multilayered vegetation and woody material, is an important component for mesocarnivores and avian species. DFPZs, group selection, and individual tree selection treatments would result in the loss of late-successional growth and could introduce additional fragmentation of habitat and wildlife travel corridors. In addition, activities on private lands have been adding to the fragmentation and decline of suitable habitat through urbanization, damming of rivers, construction of roads, and private timber management. The tradeoff of not implementing DFPZs, however, would be the potential for a high-severity wildfire that could destroy large tracts of habitat. In addition, the short-term effects would be outweighed by the long-term benefits of maintaining or restoring open stands of large trees.

The DFPZs would be situated to avoid California spotted owl Protected Activity Centers (PACs), Spotted Owl Habitat Areas (SOHAs), federally listed Threatened and Endangered species, and old-forest stands (CWHR size classes 5M, 5D, and 6D within late-successional old-growth rank 4 and 5 stands). There are no northern goshawk PACs, great gray owl PACs, or fisher den sites in the Slapjack Project area. The proposed treatments are not in the draft forest carnivore network.

DFPZ Maintenance. The use of herbicides to maintain DFPZs is recommended where tanoak makes up to 10 percent or more of the stand composition by basal area (see chapter 2 for a detailed description of the alternatives and proposed treatments). The herbicide imazapyr would be used specifically to control tanoak and shrub regrowth and prevent its re-formation as ladder fuels. Black oak and live oak are important habitat components for wildlife and are nontarget species. The Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA) contains specific direction for oak management that would be adhered to at the site-specific project level (refer to appendix K in the BA/BE for species-specific effects from the use of herbicides).

The effects of imazapyr on wildlife were analyzed in the HFQLG final supplemental EIS (this document should be reviewed for specific information on herbicide application and its effects).

Snags and Large Down Wood. Down woody debris and snags are essential habitat components for several old-forest-associated species including California spotted owl, northern goshawk, American marten, and Pacific fisher. Across the treatment units, approximately 10–15 tons of large down wood per acre would be retained. An average of four snags per acre would be retained.

Riparian Restoration Projects. All applicable BMPs would be implemented during the replacement of the culverts. Mulching and revegetation would occur as determined on a site-by-site basis to prevent soil erosion following project implementation. This work would be conducted in fall when the water level is lower and there would be fewer impacts on fish.

Direct Effects. The installation (replacement) of culverts would create short-term direct effects (1–3 months), such as increased sedimentation and reduced water quality, from the ground-based equipment that would be used in the drainage during culvert replacement. There is the potential for a trout species to get crushed by equipment or suffocated by sediment churned up by the installation of a new culvert or upgrading of the existing culvert. The project sites would be electrofished prior to construction.

There would be a long-term beneficial direct effect by improving the aquatic connectivity and resizing the culvert to accommodate a 100-year flood in the project area. The proposed aquatic species passage projects would improve watershed connectivity and open up 3.75 miles of high-quality spawning, holding, and rearing habitat for trout and, potentially, for hardhead minnow.

There would be no direct effects on hardhead minnow or trout species from the bank stabilization and meadow restoration projects.

Indirect Effects. The culvert improvement and bank stabilization projects would create a short-term indirect effect by increasing sedimentation during construction, but with the implementation of BMPs, the effects would be minimized. There would be a long-term indirect effect on hardhead minnow and trout species habitat downstream from the resizing of the culvert to accommodate a

100-year flood and stabilizing the banks to reduce erosion. This work would result in reduced water quality. There would be a positive indirect effect on hardhead minnows and MIS trout species by improving retention of water for augmented baseflow of streams below the restored meadows (see the "Hydrology Report" in the project record). There would be a positive indirect effect on hardhead minnow and trout species due to improved downstream water quality.

Cumulative Effects. The bank stabilization and meadow enhancement projects would result in improved hydrologic function and water quality below the culverts. This would produce a positive cumulative effect from the overall reduction in ERA values.

3.13.5.3 All Action Alternatives: Effects on California Red-legged and Foothill Yellow-legged Frogs from DFPZ, Group Selection, and Individual Tree Selection

Critical Habitat for the California red-legged frog is currently being reevaluated and re-proposed by the U.S. Fish and Wildlife Service (USFWS). In contrast to the latest USFWS proposal for Critical Habitat, the Plumas National Forest is excluded because the provisions of the SNFPA and Adaptive Management Strategy provide more benefits for the conservation of California red-legged frog Critical Habitat than would the USFWS proposed provisions. A final Recovery Plan is available that provides direction for managing this Threatened species (USFWS 2002).

Buffers around aquatic and riparian areas would be used to minimize the amount of project activity. Aquatic habitat would not be directly entered except for potential habitat enhancement or maintenance. In the DFPZ plantation treatment areas, RHCAs would be treated to improve riparian habitat conditions (see appendix A in the "Hydrology Report").

Direct Effects. No direct adverse effects are expected to occur from project activities; however, potential direct effects could occur from proposed vegetation and fuels treatments, if the activities were to occur in riparian or aquatic habitats. Loss of riparian vegetation, especially along shorelines, would increase access for predators and reduce estivation (dormancy in summer for some animals) sites. Decreased shading of aquatic systems would increase water temperatures, which could cause reduced rates of embryonic survival and potentially contribute to the declining trend in frog populations. It is highly unlikely that breeding California red-legged frogs or yellow legged-frogs would be present in or near the proposed treatment areas. Activities that would require the use of heavy equipment (such as for timber harvest and mastication), or could cause ground disturbance (grubbing), would have the potential to disturb and/or kill individual frogs if they are present during project implementation. However, any potential adverse direct effects would be avoided by the implementation of management standards and guidelines.

Indirect Effects. No major indirect adverse effects are expected to occur, but minor effects could occur. Impacts on amphibians from logging activities would include changes to their upland habitat quality and quantity. Dispersal habitat may be adversely affected if vegetation or soils are disturbed near perennial or intermittent streams.

Mastication activities would take place in the dry season when frogs would not be traveling overland. Mechanical harvesting would not result in direct mortality because these activities would be

scheduled during the nondispersal period (before October 15th or the first wetting rains) and because mechanical harvesting is prohibited in the RHCAs. No group selection skid trails would cross streams with running water. In addition, it is expected that none of the skid trails associated with DFPZ construction would cross RHCAs. Consequently, indirect effects due to skidding would likely not occur or would be minimal. Stream crossings, springs, and water sources for dust abatement would be checked by the district biologist for the presence of sensitive frog or turtle species prior to project implementation.

Prescribed fires would not affect canopy cover in RHCAs, but they could remove some ground cover. This would be minimal because the fires would not be ignited in the RHCAs. The implementation of Standard Protection Measures would help minimize indirect effects on amphibians and reptile species. Burns occurring before the first soaking rains of the fall are least likely to directly affect amphibians because the frogs would be in the RHCAs at that time. Burns occurring during the spring would be more likely to cause direct effects on amphibians and reptiles, as individuals would be outside the RHCAs at that time.

California red-legged frog dispersal habitat provides connectivity between breeding habitat and upland habitat. The proposed dispersal area for the California red-legged frog is 0.7 mile (*Federal Register* 2005) for known populations. In consultation with the USFWS, a 1-mile dispersal area was applied to known populations in the Slapjack Project area. There are 72 acres (36 acres of DFPZs, 7 acres of individual tree selection, and 29 acres of mastication) of proposed treatments within the 1-mile dispersal area. These treatment units are located on the outer boundaries of the 1-mile area for dispersal for the known site. Within the subwatershed boundary, an approximate a 2-mile area, there are 661 acres proposed of DFPZs and group selections; Scientific Analysis Team and RHCA guidelines would apply. Other potential suitable habitat in the project area was indentified at Cottage Creek. The proposed treatments (DFPZs and group selection) are approximately a 0.25 mile from Cottage Creek. The DFPZ treatments are older plantations proposed for mastication, hand cut pile, and burn units. Aquatic habitat would not be directly entered, except for potential habitat enhancement or maintenance of riparian habitat.

The implementation of the Standard Resource Protection Measures in the project description and procedures detailed in the Burn Plan for the project would reduce the probability of habitat loss from prescribed fire for all species. The Slapjack Project would have a beneficial indirect effect because it may reduce the potential for a stand-replacing wildfire, which is a threat to habitat for forest-dwelling species.

Group selection and DFPZ construction in the uplands (including ridge tops) could potentially change the hydrologic regime in the project area. There could be the potential for a reduction in suitable habitat if project activities alter flows or reduce the availability of surface water (refer to the BA/BE for the HFQLG Act final EIS for more discussion). Soil erosion could direct sedimentation into streams, which could suffocate egg masses and/or tadpoles; however, no minimal disruption in surface and subsurface flows or sedimentation into streams is anticipated because Scientific Analysis Team guidelines would be followed, and RHCA buffers and Best Management Practices would be implemented. Any potential adverse indirect effects would be avoided.

Cumulative Effects. Cumulative effects on amphibian habitat have occurred from vegetation management, recreational uses, introduction of nonnative species, road construction, timber salvage

activities, water diversions, and wildfire. A past event that could contribute to cumulative effects includes the Pendola fire of 1999, which burned through Dobbins and Cottage Creek. After the fire, there were salvage projects on forest lands and private lands by two companies: Che and Siller Brothers. The two companies retained little to no riparian buffers from their projects. Before the fire, Dobbins Creek had already experienced impacts from mining that occurred in earlier years—the mine tailings are evident throughout the area. The HFQLG Act Record of Decision, and its associated Scientific Analysis Team guidelines for DFPZ construction, and the SNFPA Record of Decision's aquatic strategy for DFPZ maintenance, would not only prevent or strictly control any additional impacts on frog habitat, but would result in actual habitat restoration and enhancement for some streams. It is unlikely that the proposed activities would be a significant addition to cumulative effects on the frog species, and habitat characteristics would not change to a degree that these effects would limit populations; therefore, there would be very few cumulative effects.

The informal consultations that occurred with the U.S. Fish and Wildlife Service for the California red legged-frog conclude that the actions implemented on a programmatic and project level would likely not adversely affect this species

3.13.5.4 Alternatives B, E, and F: Effects on the California Red-legged and Foothill Yellow-legged Frogs from Imazapyr for DFPZ Maintenance

SERA provides very few studies related to the effects of herbicides for any amphibian species. There is extremely limited published data on the relationship of herbicides proposed for use. Refer to the discussion for invertebrates, a primary food for amphibians and the discussion for fish, for an analysis of herbicide effects in the HFQLG final supplemental EIS.

The risks to a variety of aquatic, amphibian, and reptilian species varies with the chemical(s), rate(s), timing, and other factors requiring site-specific information. Given the unpredictability of potential exposures, the lack of toxicological data relevant to subcutaneous exposures for adult frogs, it is not possible to assess full risks to these species.

Direct Effects. Direct effects on amphibian species could occur if amphibians were to come into direct contact with the herbicides, and if so, the toxicity of the herbicide could be of concern. Amphibians have permeable skin, and they breathe through their skin, making them exceptionally vulnerable to chemicals in their environment (water, land, and air). Although there is very little information regarding the effects of herbicides or surfactants on amphibians surrogates, studies reviewed have shown adverse effects on amphibians, if sufficiently exposed to some herbicides (Thompson 1998; Hall and Henry 1992; Berrill et al. 1994; and Bidwell and Gorrie 1995). There was no available information on effects or risk analysis specific to imazapyr.

No imazapyr herbicide would be used within the watershed of the known California red-legged frog population, and recent surveys have revealed no other populations in the project area. In addition, aquatic and riparian zones would not be targeted vegetation proposed for herbicide treatment.

Indirect Effects. Even though aquatic and riparian habitats would be avoided the potential for run-off, percolation, and drift into watercourses or spray contaminating food sources such as invertebrates and aquatic or riparian plants is of some concern.

Surface and subsurface runoff and wind erosion are particularly important in the aquatic environment. Under normal and expected conditions of herbicide and surfactant use, background concentrations would be found in the aquatic environment. This concentration is highly site-specific and depends on many factors, including the mobility of a given herbicide in the soil, soil type, soil pH, soil moisture holding capability, rainfall, and application rate, chemical degradation, and ambient and soil temperatures. For specific information regarding these factors, refer to "Environmental Fate" (HFQLG Act final supplemental EIS, appendix F). Estimates of background herbicide concentrations in the aquatic environment following normal herbicide application are given in the SERA Reports (SERA 1996-2001 and 2003).

Since runoff, percolation, and wind erosion are highly site and chemical specific, these factors must be addressed in an herbicide plan at the site-specific project level. The need for any buffers or other protection measures would be implemented at the site-specific project level.

Indirect effects on amphibians from herbicides on their invertebrate food source are expected to be more similar to the analysis for small mammal species than any other group of species. The acute exposure by small mammals consuming contaminated insects is discussed in "Terrestrial Associated Species Risk Assessment, Mammals." Imazapyr and triclopyr BEE did not show adverse effects on mammal species consuming contaminated insects. Indirect effects on amphibians from herbicides on their vegetative food source are expected to be more similar to the analysis for avian species than any other group of species. The acute exposure by avian species consuming contaminated vegetation is discussed in "Terrestrial Associated Species Risk Assessment, Avian."

There is scientific evidence that shows a strong correlation between chemical drift and amphibian declines from the Central Valley. However, this information is related to different insecticides (Davidson et al. 2000). Chapter 3 of HFQLG final supplemental EIS (Issue 2) addresses drift, indirect effects, and cumulative effects related to old forest and aquatic/riparian species. Herbicide drift is of concern and factors to consider would be wind, slope, and air moisture. Invertebrate prey species and vegetation could be affected by herbicide drift, but actual effects are unknown. It is expected that any effects from potential drift of herbicides would be far less than from the exposure rates from direct spray.

Aquatic and riparian zones are not the target vegetation proposed for herbicide treatment except for limited invasive plant or noxious weed control. Use of any herbicides within aquatic/riparian ecosystems would be evaluated at the site-specific project level. With full implementation of all protection measures, such as 500-foot amphibian buffers and 300–foot perennial stream buffers (as recommended by the Scientific Analysis Team), following BMPs, and applying herbicide mitigations, there is no indication that California red-legged frog and Foothill yellow-legged frog would be exposed to adverse levels of imazapyr or triclopyr BEE under the conditions of use specified. The indirect effects of imazapyr application should be low.

Cumulative Effects. Exposure for mammals was based on 100 percent absorption that would be more reflective of potential exposure for amphibians. Amphibians disperse when the first wetting

rains start to fall, usually during the month of October. Amphibians move back overland into or near streams systems typically by late March. Herbicide and surfactant application would not be occurring during times of precipitation, especially during the wet season. Surveys would be conducted prior to any management activities following Forest Plans, as amended by HFQLG Act final supplemental EIS and SNFPA final EIS, direction and guidelines. Surveys were conducted prior to DFPZ construction (refer to HFQLG final supplemental EIS).

No herbicides would be used in perennial, intermittent, or ephemeral streams. The assessment of cumulative effects was made based on implementation of riparian and aquatic "protection measures" managed under HFQLG, as amended by the Sierra Nevada Forest Plan and administered by the Plumas National Forest. It is expected that cumulative effects based on implementing alternatives B, E, and F would have minimal indirect effects, and direct adverse effects of herbicides are not expected to occur.

3.13.5.5 Alternatives B, D and F: Effects on the California Red-legged and Foothill Yellow-legged Frogs from Triclopyr BEE for Noxious Weed Control

Triclopyr BEE is proposed to control 31 acres of noxious weed, several species of Broom. The herbicide will be a direct spray. Expected herbicide drift is 50 feet. Aquatic and riparian habitat will be avoided. Perennial fish-bearing streams will have 300-foot buffers, and perennial non fish-bearing and intermittent streams will have a minimum 150-foot buffer with no application. No direct, indirect, or cumulative effects are expected.

Direct Effects. Direct effects on amphibian species could occur if amphibians were to come into direct contact with the herbicides, and if so, the toxicity of the herbicide could be of concern. Amphibians have permeable skin, and they breathe through their skin, making them exceptionally vulnerable to chemicals in their environment (water, land, and air). For a few studies that were conducted, values are available for triclopyr (Bidwell and Gorrie 1995; Perkins et al. 2000; Berrill et al. 1997; CDFG 1998; Berrill et al. 1994; Fort et al. 1999; and USFS 2003).

A study of three species of frogs in Ontario, Canada, found that low concentrations of triclopyr BEE inhibited their avoidance behavior. Tadpoles normally move when touched or prodded; this behavior helps them escape from predation. Tadpoles of all three species exposed to just over 4.0 parts per million (ppm) of triclopyr lost their avoidance response. Tadpoles initially affected by exposure to lower concentrations of triclopyr usually recovered within 1–3 days. Newly hatched tadpoles of all species were very sensitive to 2.4 and 4.8 ppm triclopyr, either dying or remaining paralyzed following exposure. The researchers from Trent University and the Canadian Wildlife Service concluded that newly hatched tadpoles of all species were very sensitive to 2.4 and 4.8 ppm of triclopyr and "is likely to paralyze the sensitive tadpoles, and such exposure may occur in a managed forest system." At exposures of 1.2 ppm, there were no deadly effects on these frogs (Berrill et al. 1994).

Tadpoles initially affected by exposure to lower concentrations of triclopyr usually recovered within 1–3 days (Berrill et al. 1994). In both the triclopyr and hexazinone experiments conducted by Berrill et al. (1994), tadpoles appear to have been unaffected by their exposure as embryos to either

herbicide. The authors conclude that the jelly layer on frog eggs probably provides additional protection, compared to fish eggs. Direct effect threshold values were not available for amphibian species. The acute exposure for small mammals from direct application is discussed within "Terrestrial Associated Species Risk Assessment, Mammals." Acute exposures for triclopyr BEE is below the LD/LC_{50}. Exposures for mammals were based on 100 percent absorption that would be more reflective of potential exposures for amphibians. Amphibians disperse when the first wetting rains start in fall, usually during the month of October. Amphibians move back overland into or near streams systems typically by late March. It is expected that herbicide application would not be occurring during times of precipitation. SNFPA standards and guidelines are set to avoid pesticide application within 500 feet of known occupied sites for the California red-legged frog, Cascade frog, Yosemite toad, Mountain yellow-legged frog, Foothill yellow-legged frog, and Northern leopard frog a 300 foot buffer around streams within the dispersal area of known site, and a 150-foot buffer in the watershed of the known population. Additional protection measures, such as Limited Operating Periods would be applied. No direct adverse effects are expected to occur. See table 3-57 for summary of doses in surrogate species.

Table 3-57. Summary of herbicide use and risks compared to the NOEL/NOAEL and LD_{50}/LC_{50} in surrogate aquatic and riparian species.

Herbicide	NOEL/NOAEL[a]	LD_{50}/LC_{50} [a]	Risk Assessment	
			Amphibian	Reptile
Imazapyr	Below	Below	Low	Low
Triclopyr BEE	Exceeded	Below	Some	Some

Source: USDA Forest Service 2003

Note:

a. See the "Glossary" at the back of this document for definitions.

Indirect Effects. As far as affecting viability of special status amphibian species, a major spill could affect the future reproductive ability of frogs associated with a stream or the potential loss of a population, especially if associated with an isolated water source. Triclopyr BEE exceeded the NOEC and lethal levels by factors of 9.1 and 4.5, respectively. Exposures were below the LD/LC_{50} but resulted in observable effects when applying picloram and triclopyr BEE. Stream flows should dilute any stream spills; however, any spills near or in ponds could be of concern. Triclopyr BEE resulted in adverse exposure levels from consuming contaminated vegetation. Although triclopyr BEE exposures would be of concern, spill scenarios, worst-case or otherwise, are not expected. Following herbicide mitigations, mixing would not occur near watercourses. No indirect adverse effects are expected to occur.

A SNFPA standard and guideline is "prohibit storage of fuels or other toxic materials within Riparian Conservation Areas and Critical Aquatic Refuges except at designated administrative sites. Ensure that spill plans are reviewed and up-to-date." With full implementation of protection measures, such as a "Spill Contingency Plan," 500-foot amphibian buffers, and 300-foot Scientific Analysis Team perennial stream buffers, no herbicides are proposed in RHCAs, thus no cumulative adverse effects are expected to occur.

Cumulative Effects. Refer to the above discussion on imazapyr. There would be no cumulative effects from implementing alternatives B, D, or F.

3.13.5.6 All Action Alternatives: Effects on the Northwestern Pond Turtle from DFPZs, Group Selection, and Individual Tree Selection

Direct Effects. The major factors that could pose a risk to the northwestern pond turtle are changes in riparian and aquatic habitat abundance and quality, breeding site disturbance, and risk of high-severity fires. Northwestern pond turtles require aquatic habitat for breeding, and young are highly dependent on aquatic habitat until maturity. There would be no noxious weed treatments scheduled around ponds in the project area. Surveys were conducted in areas proposed for DFPZ construction and would be conducted prior to any DFPZ maintenance activities. The implementation of Limited Operating Periods, buffers, or other protection measures would be applied if it is determined that activities could adversely effect the northwestern pond turtle. Movement to nests in upland habitat could be affected by project activities. Equipment or workers could crush the turtles as they move to and from aquatic zones to upland breeding sites and could disturb or crush adults that are hibernating upland. In addition, nest sites with eggs or young could be adversely affected, as could the young turtles as they move back to aquatic habitat. Although riparian habitat is not the vegetation type proposed for prescribed burns, the burns could run into riparian habitat; however, protective measures would be in place to ensure that ponds and upland habitat are protected. In addition, measures have been taken to protect the area when turtles may be moving upland to lay eggs and/or hibernate. Based on the above information, direct effects are not expected to occur.

Indirect Effects. Indirect effects could occur due to potential loss of riparian habitat and important habitat components such as large woody material and ground cover during prescribed burning activities. This loss of riparian vegetation could limit potential breeding sites and invertebrate prey base. This would likely only occur if high-intensity wildfires were to enter riparian habitat and aquatic zones and remove a substantial amount of forest ground cover. Prescribed burns are expected to be of low intensity, but if loss of ground cover were to occur, it would likely be low. The intent of a DFPZ is to reduce the risk of high-intensity fires and thus prevent the loss of riparian habitat. However, some decreased shading could occur as a result of DFPZ construction, but effects are expected to be low. Group selection and individual tree selection are not proposed in riparian zones.

Indirect effects are expected to be low due to the implementation of riparian protection measures as described in the HFQLG Act final EIS, Scientific Analysis Team guidelines, the SNFPA Aquatic Strategy and Riparian Management Objectives, and associated Forest Plan standards and guidelines to maintain or improve key riparian components and implement actions to reduce fire hazard.

Cumulative Effects. The Slapjack Project area and the lands outside the project boundary have experienced many cumulative impacts in past years. In the 1920s, the Hutchinson Lumber Company operated a logging camp in the town of Feather Falls. Camps were constructed nearby to accommodate the lumber company. One of the camps was in the same area where northwestern pond turtles are found today. Mooretown, located to the west of Feather Falls, was a mining and trading center. At Hampshire Creek, extensive mining and timber operations in the past have impacted an archaeological site. Currently, there are buffers around the heritage resource site to protect it. The road at Hampshire Creek has been impacted by past and present activities and is proposed to be

closed as part of the Slapjack Project. At Cottage Creek, the 1999 Pendoloa fire destroyed much of the timber and trigged the growth of undesirable underbrush. The ongoing private land operations, in conjunction with the Slapjack Project, could have a negative cumulative impact on the northwestern pond turtle; however, the Slapjack Project proposes construction of DFPZs to help prevent catastrophic fires, remove thick underbrush, decommission roads, repair culverts, and enhance riparian areas.

There would be no direct effects, but minimal indirect effects, on the northwestern pond turtle from DFPZ construction, group selection and individual tree selection. There would be low incremental cumulative effects. The guidelines set forth in the HFQLG Act Record of Decision, with its associated Scientific Analysis Team guidelines for DFPZ construction, and the SNFPA Record of Decision guidelines covering aquatic strategy for DFPZ maintenance, would not only prevent or strictly control any additional impacts on turtle habitat, but would likely result in habitat restoration and enhanced connectivity for many streams. Due to minimal direct effects and low indirect effects, cumulative effects are not expected, or effects would be low as a result of implementation of action alternatives.

3.13.5.7 Alternatives B, E, and F: Effects on the Northwestern Pond Turtle from Imazapyr for DFPZ Maintenance

Direct Effects. Since no information exists on the effects of herbicide treatment on reptiles, effects discussed here are derived from effects on avian and fish species. Studies of herbicide effects on fish show nontoxic to moderate toxicity. Inert ingredients, additives (dyes), surfactants, and environmental factors such as water chemistry (water hardness) can influence the toxicity of the proposed herbicides. For this analysis, it is assumed that northwestern pond turtles would be no more susceptible to direct adverse effects of herbicide application than aquatic organisms, such as fish, or terrestrial animals, such as avian species. Since turtles are much less likely to absorb herbicide chemicals through their skin, and they do not breathe gills, up-take would be less than for other organisms. Conversely, turtles are less able to escape disturbances compared to avian or fish species, which can easily escape.

Herbicide and surfactant application would not be in aquatic or riparian zones. However, spill scenarios are not likely to occur. Herbicide mixing would not be done near stream courses. With full implementation of protection measures, including development of a spill contingency plan and use of 300-foot wide buffers bordering perennial steams and 500-foot buffers around ponds with known populations, spills are very unlikely to occur in waterways. Protection measures, such as Limiting Operating Periods (LOPs), would be implemented.

As far as affecting viability of a population of western pond turtles, a major spill could affect the future reproductive ability of turtles associated with a stream or pond. Exposures were below the LD/LC_{50} but could have some risk when applying triclopyr BEE. Direct effects of the herbicides should be very low for the western pond turtle. Proposed treatments would be evaluated and mitigated to avoid or reduce any potential adverse effects at the site-specific project level. Although, triclopyr BEE exposures would be of concern, spill scenarios, worst-case or otherwise, are not expected. Following herbicide mitigations, mixing would not occur near stream courses.

The egg-laying period (during June-July) and very young individuals are of most concern for possible herbicide or surfactant spray. Although, as mentioned previously, herbicides are generally applied during the spring and very early summer months when vegetation is actively growing. Herbicide treatments are not proposed near/or in streams, ephemerals, and ponds.

There is no information regarding the impacts of herbicide contact with turtle eggs. However, eggs are very porous and allow moisture to be absorbed inside the shell but that moisture does not go back out (Holland 2001). Western pond turtle nests are typically dug 15 cm (6 inches) deep (Holland 2001). The potential for leaching varies by herbicide. Herbicide spraying should not reach eggs in the nests; however, egg embryo may be susceptible to effects of herbicide contamination if the spray drains down under the soil and reaches the eggs.

Effects from direct herbicide and surfactant application to turtles when they are moving overland are expected to be more similar to avian species than any other group of species. The acute exposure for avian from direct application is discussed within “Terrestrial Associated Species Risk Assessment, Avian” in the HFQLG Act final supplemental EIS BA/BE. One factor that could reduce potential impacts is that the turtles associated with stream systems and ponds are generally widely distributed, and it is unlikely that a whole population would be moving upland to the same potentially treated area. Surveys are conducted for special-status herpetological (amphibians and northwestern pond turtle) species prior to management activities following the 1988 Forest Plan, as amended by HFQLG Act final EIS and SNFPA final EIS, directions and guidelines.

Individual western pond turtles would not be directly affected by herbicide application since aquatic and riparian habitat, the primary habitats used by this species, would be avoided. Direct adverse effects of herbicides are not expected to occur for alternatives B, E, or F.

Indirect Effects. Even though aquatic and riparian habitats would be avoided the potential for run-off, percolation, and drift into water courses or spray contaminating food sources such as invertebrates and aquatic plants is of some concern.

Consumption of contaminated food items (such as invertebrates; small fish; amphibian larvae, tadpoles and juveniles; and some plant material) may indirectly affect adult and juvenile turtle survivorship. Bioconcentration could also be of concern. Individual western pond turtles would not be directly affected by herbicide application since aquatic and riparian habitat, the primary habitats used by this species, would be avoided. Due to low to no indirect effects, there would be no incremental effects as a result of implementation of any of the action alternatives.

For imazapyr, the difference in concentrations between initiation of adverse effects and mortality is small. However, LC_{50} and NOEC values are well above expected exposure rates to the runoff/percolation and spill scenarios. No adverse effects on fish, the surrogate species for reptiles, are expected from application of imazapyr (SERA 1999). Due to low direct and indirect effects, there would be no incremental effects as a result of implementation of action alternatives.

Aquatic and riparian zones are not the target vegetation proposed for herbicide treatment except for limited invasive or noxious weed control. Use of any herbicides within aquatic/riparian ecosystems would be evaluated at the site-specific project level. With full implementation of all protection measures and BMPs, there is no indication that northwestern pond turtles would be

exposed to adverse levels of herbicides. Adverse indirect effects from implementation of alternatives B, E, or F are not expected to occur.

Cumulative Effects. DFPZ construction, employing provisions of the HFQLG Act Record of Decision and Scientific Analysis Team guidelines, and DFPZ maintenance governed by the SNFPA's Aquatics Management Strategy, would not only prevent or minimize impacts on the turtle habitat but would result in habitat restoration and enhanced habitat connectivity for many streams.

Herbicide application would not occur in aquatic or riparian zones. Direct impacts on reptiles in aquatic habitat would be expected to be similar to impacts on fish species and would be below the Threshold of Concern.

By adhering to management directions, standards and guidelines, BMPs, and mitigations, direct and indirect adverse effects are not expected; therefore, cumulative adverse effects are not expected to occur.

3.13.5.8 Alternatives B, D, and F: Effects on the Northwestern Pond Turtle from Triclopyr BEE for Noxious Weed Control

Since no information exists on the effects of herbicide treatment on reptiles, effects discussed here are derived from effects on avian and fish species.

The acute dose exceeds the acute NOAEL for the bird-eating contaminated insects with a high residue rate. Exposure from a direct spray for the mallard duck and bobwhite quail are below the acute NOAEL. If a mallard were to consume contaminated water for an extended period of time, it could lead to a chronic dose. This is well below the chronic NOAEL for avian. When making an adjustment for the variation in the pileated woodpeckers diet, consumption of the combination of contaminated berries and insects could lead to an acute dose at a high residue rate. Table 58 shows the overall summary of doses compared to the NOEL/NOAEL in surrogate species scenarios and the risk associated with those doses.

Table 3-58. Overall summary of doses compared to the NOEL/NOAEL in surrogate species scenarios and the risk associated with those doses.

Herbicide	NOEL/NOAEL[a]	Residual Rate	Risk Assessment
Triclopyr BEE	Below	High	Low

Source: USDA Forest Service 2003

Note:

a. See the "Glossary" at the back of this document for the definition of NOEL/NOAEL.

Direct, Indirect, and Cumulative Effects. Triclopyr BEE is proposed to control a maximum of 31 acres of noxious weeds. The acres proposed for treatment are over 2 miles from any known western pond turtle population. Broom plants grow in dense clumps and do not provide breeding habitat for the turtle. Perennial fish-bearing streams would have 300-foot buffers, and perennial nonfish-bearing and intermittent streams would have a minimum 150-foot buffer with no application. A guideline is "avoid pesticide application within 500 feet of known occupied sites." With full implementation of all protection measures following BMPs, there is no indication that northwestern pond turtles would be exposed to adverse levels of herbicides. Direct, indirect, or cumulative effects on the pond turtle are not expected. Aquatic and riparian zones are not the target vegetation proposed for herbicide treatment, except for limited invasive or noxious weed control. The use of any herbicides within aquatic/riparian ecosystems would be evaluated at the site-specific project level.

3.13.5.9 All Action Alternatives: Effects on Bald Eagles from DFPZs, Group Selection, and Individual Tree Selection

Direct Effects. There are no known bald eagle residents in the project area. All nesting bald eagles on the Plumas National Forest are associated with reservoirs or lakes (including the Poe Powerhouse nesting pair located along the North Fork Feather River and also Lake Oroville). Other nesting pairs are found at Bullard's Bar Reservoir on the Plumas National Forest. Suitable nesting and/or foraging habitat for the bald eagle would not be affected by construction of DFPZs or group selection and individual tree selection harvests in the project area.

Indirect Effects. A known winter roost site is located within 0.5 mile of a group selection. There are no known bald eagle residents in the Slapjack Project area. The proposed fuel treatments, group selection, and individual tree selection would not cause changes in the fishery production in Bullard's Bar Reservoir. The implementation of Best Management Practices, and the meeting of all Riparian Management Objectives (located in the project record), would ensure that no indirect effects on the fisheries or fisheries habitat would occur.

Cumulative Effects. There would be no direct or indirect effects on known bald eagle territories or bald eagle management areas on the Plumas National Forest and no direct or indirect effects on known winter roosts on the Forest. Therefore, implementation of the Slapjack Project would not contribute to cumulative effects on bald eagles or bald eagle habitat.

3.13.5.10 Alternatives B, E, and F: Effects on Bald Eagles from Imazapyr for DFPZ Maintenance

Refer to the Imazapyr effects discussion under the California spotted owl.

Direct Effects. The acute exposure for avian raptors from direct application is discussed in the "Terrestrial Associated Species Risk Assessment for Avian Species" (USDA Forest Service 2003). Acute exposures were below the LD/LC_{50} and the NOEL/NOAEL. Individual bald eagles would not be directly affected by herbicide spray since they predominately keep to tree canopies. Nest and/or roost trees would not be directly affected because they would be avoided. The USFWS "Recovery Plan for the Pacific Bald Eagle" (USFWS 1986) would be followed. The plan lists a number of recovery tasks such as surveys, avoidance, Limited Operating Periods, and buffers. The protection

measures for osprey would follow the guidelines outlined in the *Migratory Bird Treaty Act*. Direct adverse effects on bald eagles are not expected with full implementation of directions and guidelines contained in the "Recovery Plan for the Pacific Bald Eagle," the *Migratory Bird Treaty Act*, and the 1988 Forest Plan (*Plumas National Forest Land and Resource Management Plan*).

Indirect Effects. Bald eagles could be indirectly affected if stream courses, water bodies, or fish (the eagle's primary prey) were directly affected by surface or subsurface runoff, drift, wind erosion, or soil contamination. The acute exposure for a stream contaminated by runoff and/or percolation is discussed above in the indirect effects section for California red-legged frog and the foothill yellow-legged frog. Acute exposures were below the LD_{50}/LC_{50} for herbicides. The risk assessment completed for fish species concluded no direct adverse effects and low indirect adverse effects. However, the overall effects analysis for fish species concluded no direct or indirect adverse effects. Waterfowl and small mammals are a secondary food source for bald eagles and could be affected. However, these prey species are primarily winter prey and would not be a ready food source during the months herbicides would be applied. Any potential adverse indirect effects would be avoided.

Cumulative Effects. By adhering to management directions, standards, and guidelines, no direct and indirect effects are expected, and therefore, cumulative adverse effects are not expected to occur.

3.13.5.11 Alternatives B, D, and F: Effects on Bald Eagles from Triclopyr BEE for Noxious Weed Control

Direct, Indirect, and Cumulative Effects. Triclopyr BEE is proposed to control up to 31 acres of noxious weeds. There are no known eagle nesting sites in the project area. Broom plants grow in dense clumps and do not provide nesting or foraging habitat. Broom plants would be treated by direct spray. Perennial fish-bearing streams would have 300-foot buffers, and perennial nonfish-bearing and intermittent streams would have a minimum 150-foot buffer, with no herbicide application. Refer to the effects of triclopyr BEE on California spotted owl below for a complete discussion. Refer to the discussion below for the California spotted owl. Direct, indirect, and cumulative effects are not expected.

3.13.5.12 All Action Alternatives: Effects on California Spotted Owl from DFPZs, Group Selection, and Individual Tree Selection

Direct Effects. The analysis of direct effects on California spotted owl is focused on the Protected Activity Centers (PACs) and Spotted Owl Habitat Areas (SOHAs) that currently exist or were created as a result of surveys. The effects on other potentially suitable nesting and foraging habitat outside of PACs are discussed in the "Indirect Effects" section below. Direct effects are expected to be minimal under all action alternatives, as described below.

There are 22,939 acres of Forest Service land in the Slapjack Project area. Of the 22,939 acres, there are 13,317 acres of suitable nesting habitat. Of the 13,317 acres, there are 3,767 acres of PACs and 2,019 acres of SOHA and 7,531 acres outside of PACs and SOHA habitat suitable for California spotted owl nesting. PACS and SOHAs would not be entered under the Slapjack Project area. This estimate is based on the most recent vegetation data available for the Slapjack Project. According to the silviculturalist for the Feather River Ranger District, there have been no subsequent vegetation

management projects that would have altered stands in the Slapjack Project area since the aerial photos were taken in 2000.

- Direct effects on spotted owls are not anticipated in PACs or SOHAs because no treatment units fall within these protected areas.
- If spotted owls are detected during future surveys or project-related activities, PACs and Home Range Core Areas (HRCAs) would be delineated, and all treatments would be modified to comply with the standards and guidelines of the HFQLG Act final EIS and Record of Decision.
- Limited Operating Periods would be implemented within 0.25 mile of treatment units for active nests identified during current and future surveys or incidental detections.
- Proposed treatment activities could occur as early as 2006 and may continue for five years beyond the initiation of implementation. The California spotted owl survey protocol requires additional surveys if project activities continue for more than two years after the last survey year. New territories (nests) that were not located using survey protocol could be established during project implementation.
- No new road construction would occur in spotted owl PACs or SOHAs. A Limited Operating Period would be applied for any road reconstruction in PACs.
- A Limited Operating Period would be applied to haul routes within 0.25 mile of an active nest. The Limited Operating Periods are expected to reduce impacts from increased human activity and vehicle and equipment noise. Disturbance would be limited to individual treatment units and would last a few days to two weeks in any location. Impacts from disturbance are not expected to substantially affect habitat use or reproductive capacity of this species. Direct effects are expected to be low.

Indirect Effects. The DFPZs would be constructed along existing roads, ridge tops, or other suitable terrain (HFQLG Act final EIS, page 2-20). DFPZs that are constructed on ridge tops would tend not to be nesting or roost habitat preferred by owls. However, disturbance due to construction or maintenance activities could limit use by all old-forest-associated species. Concurrently, the reduction of wildfire hazard would benefit this species by reducing the threat to individuals and/or preventing habitat loss.

Within the 22,939 project acres, outside of the California spotted owl PACS and SOHAs and suitable nesting sites, there are 7,886 acres of suitable foraging habitat. The 7,531 acres of suitable nesting outside of PACs and SOHAs are also available for foraging. Of the 15,417 (7,886 + 7,531) acres available for foraging, 6,586 acres are within HRCAs established for PACs. The risk associated with habitat reduction as a result of implementation would be the loss of suitable foraging habitat in the Home Range Core Areas (HRCAs) associated with these California spotted owl PACs: YU003, YU004, YU009, YU0011, YU0012, YU0013, YU0014, YU0016, YU0022, YU0024, BU019, BU039, and BU078.

There would be a risk that the proposed treatments could result in a change of suitable habitat in the HRCAs (mapped foraging areas) below minimum foraging levels. The HRCAs are 1,000-acre foraging buffers that surround and include PACs. In the Slapjack Project area, there are approximately 6,586 acres of HRCAs associated with the PACs Of the 6,586 acres, 1,987 acres 1,734 + 105 + 148) are proposed for treatment.

- There are 4, 419 acres in DFPZs; of those, 1,596 acres are considered suitable owl habitat. Of the acres of suitable habitat, 1,734 acres are in HRCAs.
- In group selection units, there are 105 acres of suitable owl habitat; all 105 acres are in HRCAs.
- In individual tree selection units, there are 148 acres of suitable habitat; all 148 acres are within HRCAs.

The 1,987 acres are 30 percent of the 6,586 acres of HRCAs in the wildlife analysis area for the Slapjack Project (see table 3-59) and 12.8 percent of the habitat available (7,531 and 7,886) for foraging. The DFPZ units in CWHR size class 4 and 5 stands may still provide some marginal to adequate foraging habitat for spotted owls because the prescription calls for maintaining a minimum of 40 percent canopy cover (Verner et al. 1992), resulting in minimal level of suitability for foraging, at least in the short term. The individual tree selection treatments would retain a 50 percent minimum canopy cover. Also, 1,987 acres are 0.4 percent of the Pilot Project (HFQLG final EIS, page 3-103). In addition, this is expected to be a short-term impact to achieve fuels hazards reductions, improve fire-fighting capabilities, and prevent potential stand-replacing fires.

Table 3-59. Treatments in California spotted owl HRCAs, by action alternative.

	DFPZs (acres)				Group Selection (acres)	Individual Tree Selection (acres)
	Harvest	Mastication	Hand Cut, Pile, and Burn	Underburn		
HRCAs (acres)	1,179	292	7	256	105	148

There are approximately 200 miles of roads in the Slapjack Project area. In general, the existing transportation system of roads, landings, and skid trails would be used to access treatment areas and to remove products (see chapter 2 for a list of the proposed road improvements/changes).

The management requirement common to all action alternatives that could affect the spotted owl includes the retention of large trees (30 inches dbh and larger) and snags (4 per acre of 15 inches dbh and larger). However, due to operability and safety concerns, the snag retention goal may not be achieved. Down woody material (10–15 tons per acre of the largest diameter) would be retained.

Approximately 661 acres are proposed for prescribed burns, which are designed to retain large pieces of dead and down material and maintain adequate ground cover to reduce erosion. Burns would primarily remove shrubs and trees that are 0–6 inches dbh. The treatments affecting ground-level fuels would modify habitat for prey species. The removal of shrub cover may increase the susceptibility of prey species to predators, such as the spotted owl. Prescribed burns leave a mosaic of

burned and unburned areas, so some shrubs would remain to provide cover for prey species using these areas (see the effects of prescribed light burn above). The retention of snags and down woody material would aid in minimizing effects on the spotted owl and their prey species. The prescription for the RHCAs would minimize the loss of canopy cover and remove some of the dense ground cover by allowing fires to backburn into riparian habitat.

Approximately 1,110 acres are proposed for mastication. Hand cut, pile, and burn would occur on approximately 87 acres. Effects are expected to be minimal in the short term, with a long-term gain of reducing fuel loading and opening up very dense stands. This activity would reduce the existing dense understory and increase habitat suitability over time as trees increase in size and some understory returns. The retention of snags and down woody material and avoiding riparian zones would aid in minimizing effects on the spotted owl and their prey species.

The percent of canopy cover for DFPZ units for all action alternatives would be affected by implementation of group selection (canopy covers of 11 to 15 percent) in the DFPZ units. Other than the required retention of trees that are 30 inches dbh and greater, there are no canopy cover requirements for group selection. The more acres and concentrations of group selection there are per DFPZ unit, the greater the effect on the percent canopy cover. The majority of the reduction is a result of removal of trees that are 0–6 inches dbh for all action alternatives. There would be a small overall size class change for stands between the no-action and action alternatives; however, any changes would be an increase in size class. The CWHR typing changes are expected in size class and density. In most cases, the size class would stay the same, and in some situations, the size class would go up to the next size class. In most cases the stand density would be reduced. Any direct effects are expected to be low.

For all action alternatives, the majority of group selection units would become CWHR size class 1 (trees are in the seedling stage with a dbh of less than 1 inch) post-treatment. Most of the group selections would be 1.5 to 2 acres in size. The approximate amount of canopy coverage provided in a group by the remaining conifers would be 10.8 percent in Forest Service size class 3 stands and 14.7 percent in Forest Service size class 4 stands. This would make the group selection acreage unsuitable for foraging and nesting habitat. However, group selection treatments are not considered to be individual timber stands but are viewed as subcomponents of larger stands. Treatment effects on crown cover and basal area retention are, therefore, averaged over the larger stand (HFQLG final EIS page 2-5).

There are approximately 200 miles of roads in the Slapjack Project area. In general, the existing transportation system of roads, landings, and skid trails would be used to access treatment areas and to remove products (see chapter 2 for a list of the proposed road improvements/changes).

The management requirement common to all action alternatives that could affect the spotted owl habitat includes the retention of large trees (30 inches dbh and larger) and snags (4 per acre of 15 inches dbh and larger). However, due to operability and safety concerns, the snag retention goal may not be achieved. Down woody material (10–15 tons per acre of the largest diameter) would be retained.

The treatments affecting ground-level fuels would modify habitat for prey species. Prescribed burns (approximately 841 acres) would be designed to retain large pieces of dead and down material

and maintain adequate ground cover to reduce erosion. Burns would primarily remove shrubs and trees with a dbh of 0 to 6 inches. The removal of shrub cover may increase the susceptibility of prey species to predators such as the spotted owl. Prescribed burns leave a mosaic of burned and unburned areas, so some shrubs would remain to provide cover for the prey species using these areas. The retention of snags and down woody material would aid in minimizing effects on the spotted owl and their prey species. Similarly, the prescription for RHCAs would minimize the loss of ground cover in riparian areas.

It is currently not known how the prey species preferred by spotted owls (dusky-footed woodrats and northern flying squirrels) would respond to group selection and DFPZ construction. Following treatments, the habitat in most group selection units would be classified as Sierra mixed conifer (SMC) 1-2 (seedlings and saplings). As the SMC 1-2 habitat matures, woodrats may recolonize sooner than flying squirrels because they are known to use earlier successional habitats (Zeiner et al. 1990). A study in northwestern California showed that woodrat density was low until previously cut stands reached the sapling/brushy pole timber stage (15–40 years after timber harvest) (Sakai and Noon 1993). Flying squirrels would likely be absent from the group selection openings (Waters and Zabel 1995). The proposed reforestation would accelerate the process.

These small openings in the forest may be marginal for foraging spotted owls due to the isolation from the forest interior (Glenn et al. 2004). Reforestation should shorten the timeframe to develop forested stands as well as accelerate the development of old-forest conditions that owls prefer when compared to natural succession. The small mammal component of the Plumas and Lassen National Forests Case Study (USFA Forest Service 2003b) would monitor changes in small mammal density/distribution that may occur as a result of project implementation. Edges created by groups in suitable owl habitat may reduce the use of foraging habitat by spotted owls and increase use by great horned owls (an effective competitor and predator of the spotted owl).

The proposed fuel treatments would help achieve desired fire behavior and, in so doing, bring about the changes in fire regime / condition class described in the “Fire and Fuels” section (3.5) of this EIS. The effects of a potential wildfire on wildlife habitat are discussed under the effects of alternative A. Indirect effects are expected to be low.

Cumulative Effects. Cumulative effects on owls would occur from habitat modification as a result of logging, road construction, fire, and mining; habitat modification of prey species from grazing; and disturbances from roads and recreational uses. The loss of California spotted owl dispersal habitat from implementation of treatments could be detrimental to the species. Invasion of California spotted owl habitat by the barred owl may also contribute to cumulative effects. Potential effects from DFPZ maintenance include modification or loss of habitat. Indirect effects include prey base reduction due to prey habitat modifications. However, following the guidelines in the HFQLG Act final EIS (as amended by the SNFPA final EIS) would provide protection for nesting and foraging habitat. Group selections in DFPZs would decrease the probability of a wildfire destroying vast acres of potential nesting and foraging habitat.

The other proposed HFQLG projects that would alter suitable nesting and foraging habitat are listed below. These projects would not enter California spotted owl PACs or SOHAs, and the Forest Service Region 5 Protocol for surveys would be followed:

- *Basin Project* – would modify 943 acres of suitable nesting habitat and 247 acres of suitable foraging habitat. Of these 1,190 acres, 405 are HRCA habitat. Implementation of this project is scheduled to begin in 2006.

- *Bald Mountain Project* – would modify 55 acres of suitable nesting habitat and 136 acres of suitable foraging habitat. Of these 191 acres, 39 are HRCA. Implementation of this project is scheduled to begin in 2006.

- *Bald Onion Project* – would not modify any acres of suitable nesting habitat or foraging habitat, and no HRCA habitat. Implementation of this project is scheduled to begin in 2006.

- *Watdog Project* – would modify 2,031 acres of potentially suitable spotted owl nesting habitat and approximately 4,613 acres of potentially suitable spotted owl foraging habitat. All or portions of 15 PACs (2,812 acres) are in the Watdog Project analysis area. There are 5,794 acres of HRCAs in the analysis area which are associated with these 15 PACs. Portions of four SOHAs take up 763 acres of the analysis area. All proposed treatment units are outside of PACs and SOHAs. Implementation of this project is scheduled to begin in 2006.

The documented range expansion of the barred owl has been hypothesized as a contributing factor in the population decline of California spotted owls. This may occur through hybridization as well as displacement of the northern spotted owl in some areas.

The potential for the barred owl to become established and compete with California spotted owls in the Slapjack Project area is a possible additional cumulative effect, but the extent of the effect is unknown at this time.

Additional PACs and HRCAs in the project area would be created in the future, if required. The establishment of additional PACs and HRCAs, as well as northern goshawk PACs, would conserve habitat for this species. The project may affect individual California spotted owls and change the distribution of spotted owl habitat because it is part of the larger HFQLG Pilot Project. Projections for the HFQLG Pilot Project area indicate that 123,500 acres of stands with more than 50 percent canopy cover could be reduced to 40 percent canopy cover during the Pilot Project period. Over the longer term (see table 4.3.2.3g of the HFQLG final EIS), there would be a cumulative growth over current conditions of suitable nesting and foraging habitat for the California spotted owl outside of treatment areas, both inside and outside of the HFQLG Pilot Project area. Based on the direct and indirect effects, cumulative effects are expected to be low.

3.13.5.13 Alternatives B, E, and F: Effects on the California Spotted Owl from Imazapyr for DFPZ Maintenance

Based on the herbicide hazard analysis and risk assessment, coupled with the appropriate application procedures, BMPs, and appropriate mitigation measures, the application of imazapyr would have a low risk of adverse effects on the spotted owls, great gray owl, northern goshawk, and other raptors.

Direct Effects. These raptors could be directly sprayed during herbicide application, if the species were in the area targeted for treatment. However, information provided above shows that avian surrogates with direct herbicide application did not experience doses above the LD/LC_{50} and did not experience doses above the NOEL/NOAELS adverse affect levels. It is likely these raptor species would not remain in an immediate area that is experiencing disturbance or that individual northern or California spotted owl, northern goshawk, or great gray owl would predominately keep to tree canopies associated with large and/or older trees. If individuals are on the ground (hacking post or bathing) or in lower canopy, it is expected that due to the disturbance from the activities, they would fly to the mid to upper canopies or leave the immediate vicinity; therefore, the direct spray scenarios discussed above are highly unlikely to occur.

Spotted owl nest and/or roost trees would not be directly affected since existing or any newly established Habitat Conservation Areas (northern spotted owl) and PACs (California spotted owl) would not be entered for DFPZ construction and would also not be entered for maintenance. In addition, during the site-specific maintenance activities, there would be a minimum of 500-foot buffer around all spotted owl and northern goshawk nest sites (SNFPA Record of Decision). Surveys would be conducted prior to any treatment activities to make sure these species would not be adversely exposed to herbicide treatment. Other protection measures, such as expanded buffer widths or herbicide selection, would be determined at the site-specific project level. Given these conditions, direct adverse effects are not expected.

Indirect Effects. Indirect effects on these species would include the acute doses as a result of herbicide and surfactant application as discussed under the Risk Assessment section above. Indirect effects on owls, goshawks, or great gray owls could be from surface or subsurface run-ff, drift, wind erosion, or soil contamination that could affect stream courses or water bodies. Spotted owls and northern goshawks are highly associated with watercourses predominately for thermal regulation during summer months and for bathing.

Indirect effects could also include prey species that could be contaminated as a result of herbicide application. The acute doses by consumption of contaminated small mammals by these raptors are discussed above under the Risk Assessment section. All doses are below the LD/LC_{50}. For surfactants and herbicides, the doses are below the NOEL/NOAELs for the spotted owls and the northern goshawk. There may be a possibility that prey species remaining in the area could receive doses; however, doses are based on 100 percent exposure and absorption, which is unlikely for each or all prey species. Also, raptors have large foraging areas, and it is unlikely that they would repeatedly consume contaminated prey from the same site. In addition, great gray owls forage predominately from meadows, which would not be targeted for herbicide application. Any activities in California spotted owl, northern goshawk, and great gray owl PACs are required to follow SNPFA standards and guidelines, and site-specific mitigations could be applied such as Limited Operating Periods, no treatment zones, and herbicide selection. In addition, using protection measures, such as stream buffers, adverse indirect affects are not expected.

Cumulative Effects. By adhering to management directions, standards and guidelines, BMPs, and mitigations, direct and indirect adverse effects are not expected; therefore, cumulative adverse effects are not expected to occur.

3.13.5.14 Alternatives B, D, and F: Effects on the California Spotted Owl from Triclopyr BEE for Noxious Weed Control

Based on the herbicide hazard analysis and risk assessment, coupled with the appropriate application procedures, BMPs, and appropriate mitigation measures, the application of triclopyr BEE should have a low risk of adverse effects on the spotted owls, great gray owl, northern goshawk, and other raptors.

Direct, Indirect, and Cumulative Effects. Triclopyr BEE is proposed to control 33 acres of noxious weeds (several species of broom). The acres proposed for treatment are not in any known PACs. Broom plants are in dense clumps and provide neither nesting nor foraging habitat. Broom plants would be treated by direct spray; the expected herbicide drift is 50 feet. Aquatic and riparian habitat would be avoided. Perennial fish-bearing streams would have 300-foot buffers, and perennial nonfish-bearing and intermittent streams would have a minimum 150-foot buffer with no application. Direct, indirect, or cumulative effects are expected. Direct, indirect, or cumulative effects are not expected.

3.13.5.15 All Action Alternatives: Effects on Northern Goshawk from DFPZs, Group Selection, and Individual Tree Selection

Direct Effects. The SNFPA Record of Decision includes additional direction for project activities proposed under the HFQLG Pilot (and nonpilot) Project; that direction states, “Apply the standards and guidelines in this appendix for management of goshawk PACs.” Currently, there are no established northern goshawk PACs in the Slapjack Project area. The lack of detections is possibly due to such factors as low productivity years and a dense understory. Of the total 22,939 acres of Forest Service lands in the Slapjack Project area, approximately 8,502 acres are classified as suitable nesting habitat and approximately 11,753 acres are classified as suitable foraging habitat for the northern goshawk. This estimate is based on the most recent vegetation data available for the Slapjack Project.

If new northern goshawk PACs (such as nests or young) are detected in future surveys or project activities, PACs would be delineated, and applicable resource protection measures, such as Limited Operating Periods, would be applied. Without additional surveys, there is the potential that goshawks would establish new territories (activity centers) after the initial surveys were complete, and those centers would not be protected.

DFPZ construction would decrease the probability that a catastrophic wildfire would destroy potential or existing habitat. There is suitable northern goshawk habitat in the project area but no PACs; therefore, direct effects would be low to nonexistent.

Indirect Effects. Depending on DFPZ construction in an area, and how broad and broken up they are may increase the amount of horizontal diversity, which could have a beneficial indirect effect on the goshawk by increasing its prey base or decreasing the probability that a catastrophic wildfire would destroy potential or existing habitat. The underburn proposed in California spotted owl PACs and SOHAs would help achieve the horizontal diversity. Considering there is suitable nesting and foraging habitat for the goshawk in the Slapjack Project area, there may be a potential for occupied territories that were not detected by surveys.

Since there are currently no Goshawk PACs in the Slapjack Project area, but there is suitable habitat indirect, effects are expected to be low. Project treatments are expected to increase the suitability of habitat for the goshawk.

Cumulative Effects. By adhering to management directions, standards and guidelines, BMPs, and mitigations, no direct adverse effects are expected and indirect effects are expected to be low. Cumulative adverse effects would likely to be minimal. The proposed Slapjack Project treatments would be expected to increase suitable habitat for nesting and foraging, and this would have a long-term beneficial effect on the goshawk.

3.13.5.16 Alternatives B, E, and F: Effects on Northern Goshawk from Imazapyr for DFPZ Maintenance

Direct, Indirect, and Cumulative Effects. See the discussion above for the California spotted owl. By adhering to management directions, standards and guidelines, BMPs, and mitigations, direct, indirect, and cumulative effects are not expected.

3.13.5.17 Alternatives B, D, and F: Effects on Northern Goshawk from Triclopyr BEE for Noxious Weed Control

Direct, Indirect, and Cumulative Effects. See the discussion above for the California spotted owl. By adhering to management directions, standards and guidelines, BMPs, and mitigations, direct, indirect, and cumulative effects are not expected.

3.13.5.18 All Action Alternatives: Effects on the Great Gray Owl from DFPZ, Group Selection, and Individual Tree Selection

Direct Effects. There are no great gray owl territories in the Slapjack Project area. Potentially suitable habitat for the owl was surveyed, and no new nests or individuals were detected. Potential direct effects on the great gray owl may result from the modification or loss of habitat by group selection openings or habitat components through thinning (due to reduction of canopy cover and availability of future nest trees). Meadows that provide potential habitat are either not within the proposed treatment units or are in wet meadows within a treatment polygon that would have an RHCA buffer applied. If nests are discovered, protection measures would be applied. Those measures would include Limited Operating Periods within 600-feet of occupied wet meadow habitats and restricting harvest activity within 0.5 mile of nest sites. The protection measures would reduce or completely eliminate direct impacts on this species from the proposed action.

Indirect Effects. The lack of detections during surveys does not mean species absence. Group selection openings may provide additional suitable foraging habitat. Project activities are not expected to result in indirect effects on known great gray owls, and they may improve habitat conditions in certain situations. No indirect effects are expected to occur.

Cumulative Effects. Cumulative effects on the great gray owl could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, recreational use of National Forest System lands, and use of natural resources on private and federal

lands may contribute to habitat loss for this species. Based on the direct and indirect effects discussion above, the proposed project is not expected to add any other cumulative effects on great gray owls in the Slapjack Project area or the Plumas National Forest, and may improve habitat conditions in the project area in certain situations.

By adhering to management directions, standards and guidelines, BMPs, and mitigations, no direct and indirect adverse effects are expected; hence, cumulative adverse effects are not expected to occur.

3.13.5.19 Alternatives B, E, and F: Effects on Great Gray Owl from Imazapyr for DFPZ Maintenance

Direct, Indirect, and Cumulative Effects. See the discussion above for the California spotted owl. By adhering to management directions, standards and guidelines, BMPs, and mitigations, direct, indirect, and cumulative effects are not expected.

3.13.5.20 Alternatives B, D, and F: Effects on Great Gray Owl from Triclopyr BEE for Noxious Weed Control

Direct, Indirect, and Cumulative Effects. See the discussion above for the California spotted owl. By adhering to management directions, standards and guidelines, BMPs, and mitigations, direct, indirect, and cumulative effects are not expected.

3.13.5.21 All Action Alternatives: Effects on Little Willow Flycatcher from DFPZ, Group Selection, and Individual Tree Selection

The 1988 Forest Plan does not provide specific management guidelines for this species, but it does instruct the Forest Service to maintain viability of state-listed species. At a minimum, the Forest Service is directed to provide habitat sufficient to maintain existing populations. General Forest Plan guidelines direct the forest to improve habitat capability for hardwood, riparian, and meadow associated species.

Direct Effects. Wet meadows with willow shrubs appear to be the most common habitat for willow flycatchers, but riparian deciduous shrubs along streams are also used. These habitats are not targeted for treatment except in cases where treatment of noxious weeds could be proposed. There is a small amount of minimally to marginally suitable habitat in the project area RHCAs, and the lack of little willow flycatcher detections during surveys does not mean species absence. There is a small possibility that nesting pairs not detected in surveys (or that have moved to the site after surveys) may be impacted during prescribed fire activities, but occupancy of the habitat by this species would be in the summer, and most prescribed burning would occur in autumn. If nesting little willow flycatchers are found at a later date, appropriate management requirements, such as a Limited Operating Period, would be applied before implementation of treatments to reduce or completely eliminate impacts on the little willow flycatcher from the proposed action. No direct effects are expected.

Indirect Effects. Treatments would not take place near any little willow flycatcher territories, so treatment-related activities would not disturb any known little willow flycatchers. Construction of

DFPZs and group selection timber harvest in the uplands could potentially change the hydrologic regime in an area. Any activities that would alter the flows and reduce the availability of surface water on meadows in June, could result in a reduction in suitable willow flycatcher habitat (refer to HFQLG Act BA/BE for more discussion). However, with the implementation of Scientific Analysis Team guidelines, RHCA buffers, and BMPs, it is anticipated that there would be no disruption in surface and subsurface flows (see the "Hydrology Report").

In general throughout the project area, prescribed burning may impact some isolated willows. Although willows have been known to respond vigorously after fire (Stein et al. 1992), the closely related and federally endangered southern willow flycatcher is known to respond poorly in early-successional post-fire conditions (Finch and Stoleson 2000). However, fire would not be directly ignited in the required 300-foot RHCA buffer but would be allowed to back in. Low-intensity fire is not expected to cause any long-term reductions in little willow flycatcher habitat.

Scientific Analysis Team guidelines, including the creation of RHCA buffers, would serve to protect breeding little willow flycatchers from noise disturbances from road construction and reconstruction, machinery, hauling, and other project-related activities. There may be a short-term indirect effect as a result of some pile burning in groups adjacent to meadow/willow habitat, which may send smoke into some riparian deciduous shrub habitat. However, pile burning is planned for late fall or winter during the nonbreeding period. Regeneration of aspen stands, which are associated with willow habitat, may provide additional foraging and possibly nesting habitat in the long term, as well as expand protection buffers. Little willow flycatchers are associated with willows in conjunction with standing water. Removal of conifers can increase the surface water, thereby enhancing existing willow habitat. Based on the above information, no indirect effects are expected.

Cumulative Effects. DFPZs and group selection would not occur in suitable little willow flycatcher habitat. Overall, increases in urbanization and recreational use of National Forest System lands and use of natural resources on private and federal lands may contribute to habitat loss for this species. In the Slapjack Project area, riparian areas would be enhanced by proposed restoration projects, such as decommissioning the road at New Hampshire Creek, to reduce impacts on wetlands and support protection measures for the species found there.

By adhering to management directions, standards and guidelines, Best Management Practices, and mitigations, no direct and indirect adverse effects are expected; hence, cumulative adverse effects are not expected to occur.

3.13.5.22 Alternatives B, E, and F: Effects on Little Willow Flycatcher from Imazapyr for DFPZ

Refer to California spotted owl and northwestern pond turtle for a discussion of herbicide effects.

Direct Effects. Individual little willow flycatchers would not be directly affected by herbicide application since willows, the primary habitat used for breeding and foraging by this species, would not be a target species. Surveys would be conducted prior to any management activities following the 1988 Forest Plan, as amended by HFQLG Act final EIS and SNFPA final EIS, direction and guidelines. The SNFPA Conservation Strategy for the little willow flycatcher would be followed; the

strategy lists a number of protection measures such as surveys, avoidance, and buffers. Direct adverse effects on the little willow flycatcher are not expected as a result of the proposed action.

Indirect Effects. Alternatives B, E, and F could have indirect effects on little willow flycatcher and/or their habitats from surface or subsurface run-off, drift, wind erosion, or soil contamination which could affect stream-side riparian habitat. Also, invertebrates, a primary food source, could be impacted if they are sprayed. A review of exposure rates to surrogate aquatic invertebrates resulted in potential adverse doses from the use of triclopyr BEE. The acute exposure by avian species eating contaminated insects is discussed in "Terrestrial Associated Species Risk Assessment, Avian."

Aquatic and riparian habitats (such as willows) are not the target vegetation proposed for herbicide treatment, except for limited noxious weed control. The use of any herbicides in aquatic/riparian ecosystems would be evaluated at the site-specific project level and any additional protection measures would be applied.

Cumulative Effects. With full implementation of all protection measures, such as 300-foot Scientific Analysis Team perennial stream buffers and following BMPs, there is no indication that the little willow flycatcher or its prey species would be exposed to adverse levels of herbicides under the conditions of use specified. Indirect adverse effects of herbicides and/or surfactants are not expected to occur.

Because there would be no direct or indirect effects, as discussed above, the proposed project would not result in cumulative effects on the little willow flycatcher in the Slapjack Project area or the Plumas National Forest.

3.13.5.23 Alternatives B, D, and F: Effects on Little Willow Flycatcher from Triclopyr BEE for Noxious Weed Control

Direct, Indirect, and Cumulative Effects. Refer to the imazapyr discussion above and the effects discussion for the California spotted owl and northwestern pond turtle. Triclopyr BEE is proposed to control 31 acres of noxious weeds (several species of broom). The project area does not have any known willow flycatcher breeding habitat. Broom plants are in dense clumps and provide neither nesting nor foraging habitat. Broom plants would be treated by direct spray; the expected herbicide drift is 50 feet. Aquatic and riparian habitat would be avoided. Perennial fish-bearing streams would have 300-foot buffers, and perennial nonfish-bearing and intermittent streams would have a minimum 150-foot buffer with no application. No direct, indirect, or cumulative effects are expected.

3.13.5.24 All Action Alternatives: Effects on the Pacific Fisher from DFPZs, Group Selection, and Individual Tree Selection

Direct Effects. The SNFPA final supplemental EIS provides direction for managing fisher den sites. The Slapjack Project area does not have any known den sites. The Plumas National Forest has mapped a draft forest carnivore network (DFCN) across the Plumas National Forest that consists of scattered known sightings, large habitat management areas, and wide dispersal or connecting corridors. There are 1,979 acres of the DFCN in the Slapjack Project area; however, none of the 1,979 acres are proposed for treatment. The network is comprised of four components: (1) the riparian zone,

(2) old-forest habitat, (3) connectors, and (4) known sightings. None of those acres are proposed for DFPZ treatment, group selection, or individual tree selection; hence, there would be no overlap between the Slapjack Project treatment units and the DFCN. The network would eventually provide a continuously connected system of habitats focused on the needs of the American marten and Pacific fisher. This corridor is designed to provide a habitat connectivity corridor linking the Tahoe National Forest with the Lassen National Forest. Much of the DFCN lies in areas reserved from harvest for other reasons such as California spotted owl and northern goshawk PACs or designated wilderness. Because of this, there is concern for the protection of corridors between these reserves that allow immigration and emigration to maintain healthy populations.

To the north of the Slapjack Project area, the draft Forest Carnivore Network includes a riparian or movement corridor along the Middle Fork Feather River. To the east and northeast of the project area, the DFCN includes mature/old-forest blocks and a corridor along the South Fork Feather River. As mentioned above, there would be no overlap between the proposed Slapjack Project treatment units and the DFCN.

The potential direct effects on forest carnivores from vegetation management activities consist of modification or loss of habitat or habitat components, especially with regard to denning/resting habitat and foraging/travel habitat. Direct effects would also include behavioral disturbance to denning from logging, road building, or other associated activities. There are no known forest carnivore den sites in the project area, but there is suitable habitat in the project area, and the lack of detections does not mean species absence. If a den site is found in the future, the site would be protected, and a Limited Operating Period would be implemented within 0.5 mile of the den site (USDA Forest Service 1999, 2001). Direct effects are not expected.

Indirect Effects. The 2004 Record of Decision on the SNFPA final supplemental EIS states that a higher than average canopy closure is a habitat attribute important to the fisher and that a minimum of 40 percent canopy cover is needed. Additional forest carnivore habitat may exist outside of the DFCN. Forest carnivores primarily travel and forage along rivers and streams, but they den and forage in mature/old-forest habitat. Riparian zones (used as travel corridors), in general, would not be altered by the proposed treatments; therefore, indirect effects that could result from implementation of any of the action alternatives would have minimal effects on nesting or foraging habitat of forest carnivores.

Implementation of any of the action alternatives should have little effect on the approximate 758,431 acres of suitable denning and foraging habitat identified in the HFQLG final EIS (page 3-110).

Outside of the DFCN, but within the Slapjack Project area, there are 19,905 acres of suitable denning/resting habitat and 4,549 acres of suitable foraging / travel habitat. Of the proposed treatments, group selection would have the greatest impact on fisher habitat, since group selection would create openings from 0.5 acre to 2 acres and average 1.5 acres. Group selection has the potential to create fragmentation of contiguous areas and, because fishers are prone to localized extirpation, colonizing ability is somewhat limited. Habitat connectivity is a key to maintaining fisher populations within a landscape. Avoidance of open areas may restrict fisher movement between habitat patches and decrease colonization of unoccupied yet suitable habitat. The highest likelihood of conserving fisher populations is management of areas large enough to include many contiguous home

ranges. The proposed alternatives would not increase any large-scale, high-contrast fragmentation above existing levels. The design features of DFPZs would retain habitat elements within the range of those used by fisher for foraging and dispersal, such that the DFPZs would likely note create large barriers to further expansion and connectivity to fisher habitat (BA/BE for the HFQLG final EIS, page 243) In addition, the proposed treatments would not be within the draft Forest Carnivore Network. No observations of Pacific fisher have been recorded in the Slapjack Project area. The risk for potential stand-replacing fires would be higher under the no-action alternative, which could mean a loss of many more acres of potentially suitable nesting, foraging, roosting, and travel habitat in the long term. The Pacific fisher may be affected by project activities, but the activities are not expected to result in significant indirect effects. Although forest carnivores may be affected, indirect effects are expected to be low. Project treatments are expected to improve habitat conditions in the long term.

Outside of the DFCN and within the Slapjack Project area, implementation of any of the action alternatives could effect 1,597 acres of potential denning and resting habitat to below suitability and 1,828 acres of foraging and travel habitat to low suitability for Pacific fisher. This analysis is based on HFQLG Act final EIS, page 3-110; these, however, would be short-term effects. The risk for potential stand-replacing fires would be higher under the no-action alternative, which could mean a loss of many more acres of potentially suitable nesting, foraging, roosting, and travel habitat in the long term. Also, even though habitat outside of the DFCN boundaries is potentially suitable, this habitat has a lower potential for selection for habitat utilized by forest carnivores.

Cumulative Effects. Cumulative effects on forest carnivore habitat could occur from the incremental reduction of the quantity and/or quality of habitat for this species. Overall, increases in urbanization and recreational use of National Forest System lands, and the use of natural resources on state, private, and federal lands, may contribute to habitat loss for this species. High-intensity stand-replacing fires, and the methods land managers use to control them, have contributed, and may continue to contribute to loss of habitat for this species.

The eventual implementation of other proposed HFQLG projects could potentially alter habitat within the DFCN. The Basin Project proposal includes 17 acres of individual tree selection and 407 acres of group selection within the DFCN. The Meadow Valley Project proposes to place 420 acres of DFPZs and 123 acres of group selections within the DFCN. The Bald Mountain Project includes group selections that would modify 62 acres and individual tree selection that would occur on 95 acres. These three projects are scheduled to begin in 2006.

The protection of California spotted owl and northern goshawk PACs, and the establishment of the DFCN and RHCAs, would provide connectivity between large blocks of suitable habitat. In addition, implementation of Riparian Management Objectives would also improve habitat conditions within riparian corridors. Implementation of any of the action alternatives would not increase any large-scale, high-contrast fragmentation above current levels. As stated in the carnivore analysis, no observations of Pacific fisher have been recorded in the Slapjack Project area. Since direct effects are not likely and indirect effects would be low, it is expected that cumulative effects would be low.

3.13.5.25 Alternatives B, E, and F: Effects on Pacific Fisher from Imazapyr for DFPZ Maintenance

Based on the herbicide hazard analysis and risk assessment, coupled with the appropriate application procedures, best management practices and appropriate mitigation measures, the application of imazapyr should have a low risk of adverse effects on small-sized mammal species.

Direct Effects. Acute exposures from direct spray are below the LD/LC_{50}s for all nine herbicides and surfactants. Of the nine herbicides, only hexazinone exceeded the NOEL/NOAEL. Habitat Conservation Areas established for the northern spotted owl, PACs established for the California spotted owl, 500-foot buffers around northern goshawks and California spotted owl nest sites and great gray owl PAC protection measures would provide some protected old-forest habitat for these species. Mesocarnivores could be affected if they are sprayed when traveling in or between watersheds over ridges. However, they would tend to move from the area where treatment activities occur or avoid disturbance by escaping to the forest canopy. In addition, herbicides would not be applied within riparian zones, with the exception of possible noxious weed treatments that are proposed for DFPZ maintenance. It is expected that mesocarnivores would leave an area during disturbance from herbicides application. Surveys are required to be conducted for these species prior to DFPZ construction and maintenance. If a den site is located, it would be protected (avoidance buffer, Limited Operating Period) at a site-specific project level. Given these conditions, there should not be direct adverse effects on medium- and large-sized mammals.

Indirect Effects. Indirect effects could also include prey species (predominantly small mammals) that could be contaminated by herbicide application. The acute dose by consumption of contaminated small mammals by a medium-sized mammal is analyzed above under the Risk Assessment discussions. For all nine herbicides and surfactants, the doses are below the LD/LC_{50}s and the NOEL/NOAELs, the level for adverse effects for medium and large-sized carnivorous mammals. Additional indirect effects on mesocarnivores could result from surface or subsurface run-off, drift, wind erosion, or soil contamination that could affect stream courses or water bodies, although these effects would be expected to be even further below NOEL/NOAELs. The DFPZs may be constructed through a stream courses to maintain the continuity of the DFPZ; however, hand treatment would be the only method prescribed to maintain these areas. Therefore, aquatic and riparian zones would be avoided, except for possible noxious weed control for DFPZ maintenance. Indirect adverse effects are not expected.

Cumulative Effects. By adhering to management directions, standards and guidelines, BMPs, and mitigations, direct and indirect adverse effects are not expected; therefore, cumulative adverse effects are not expected to occur.

3.13.5.26 Alternatives B, D, and F: Effects on Pacific Fisher from Triclopyr BEE for Control Noxious Weed Control

Based on the above information, when applying the appropriate application procedures, best management practices and appropriate mitigation measures, the application of triclopyr BEE should have a low risk of adverse effects to medium and large-sized mammal species.

Direct, Indirect, and Cumulative Effects. Refer to the discussion above for imazapyr.

Triclopyr BEE is proposed to control 31 acres of noxious weeds, including several species of broom. There are no DFCN acres in the project area. Broom plants are in dense clumps and are not nesting or foraging habitat. Broom plants would be treated by direct spray; the expected herbicide drift is 50 feet. Aquatic and riparian habitat would be avoided. Perennial fish-bearing streams would have 300-foot buffers, and perennial nonfish-bearing and intermittent streams would have a minimum 150-foot buffer with no application. No direct, indirect, or cumulative effects are expected.

3.13.5.27 All Action Alternatives: Effects on Pallid, Western Red, and Townsend's Big-Eared Bat from DFPZ, Group Selection and Individual Tree Selection

The project area contains habitat for all three of the Forest Service Sensitive bat species. The implementation of Management Area direction and habitat prescriptions and allocations for California spotted owl, northern goshawk, forest carnivores, little willow flycatcher, great gray owl, and amphibians would provide for many acres of untreated mature or old-forest and riparian habitat (see the 1988 Forest Plan, as amended by the 1999 HFQLG Act final EIS and 2004 SNFPA final supplemental EIS). The Standard Management Requirements include the retention of large trees (30 inches dbh or greater), snags (4 per acre of 15 inches dbh or greater), and downed woody material (10–15 tons per acre of the largest diameter). The Slapjack Project “Silviculture Report,” appendix A, table A-4, provides a summary of trees per acre by dbh class for black oak and tanoak.

The treated acres could provide many of the habitat attributes necessary to support sensitive bat species by employing Best Management Practices and Scientific Analysis Team guidelines and by maintaining aquatic and riparian ecosystem processes in the RHCAs. Limited Operating Periods for the California spotted owl and northern goshawk overlap the spring and summer seasons when bats are rearing their young. Where these Limited Operating Periods are implemented, further minimization of disturbance to bat species is likely. The Standard Management Requirements and/or Resource Protection Measures and mitigations identified above would reduce or eliminate possible direct and indirect affects on the three bat species. Of the three bat species, it is expected that pallid bats could potentially be more directly impacted due to their general use of the forest for roosting and foraging. A study initiated by the Forest Service and entitled “Pallid Bat - Habitat Use Assessment” is planned to start in 2006, and some information for management purposes may possibly be available prior to implementation of the Slapjack Project. It is anticipated that part of the pallid bat study would take place in the Slapjack Project area. Western red bats are more dependent on riparian habitat for roosting and foraging, and Townsend’s big-eared bats are more closely associated with structures (such as caves, bridges, and buildings) for roosting and riparian habitat for foraging. It is expected that the latter two species would be more indirectly affected.

Direct Effects. Direct effects from the proposed treatments are possible because all three sensitive bat species have been observed in the project area. However, pallid bats would tend to be the bat species that would be found roosting in the general forest. Pallid bats tend to select snags and large-diameter trees (greater than 20 inches dbh) to roost in. Destruction of active roosts through felling and/or removal of large trees, small trees with hollows, or mature oaks could displace or harm individual bats. Hazard trees, including snags, along the road and those removed for safety or operability reasons, could result in direct mortality of bat species that may be roosting in the tree or

snag. Project activities could also result in the loss of structures used by Townsend's big-eared bats; however, surveyors did not find any potentially suitable structures in the project area.

All action alternatives would result in a reduction of the number of trees per acre, but trees 30 inches dbh and greater would not be removed under any action alternative. In addition, retaining snags and employing riparian protection measures would help protect bat habitat and foraging areas. Mastication (1,110 acres), underburning (661 acres), or hand cut, pile, and burn (87 acres) would not effect much change on overstory stand structure.

Adult bats may be able to flee from the destruction of their roost tree, but if activities were to take place in spring and early summer, juvenile bats (prior to initiation of flight skills) would have no means of escaping direct disturbance and would be killed if roost trees were felled. Prescribed burns in the spring could affect pallid bats due to their habitat preferences. Forest Service fire personnel intend to limit spring underburning to a minimum and do as much burning as possible in the fall. Conducting prescribed burns during fall months would minimize the risk of mortality to bats because, by fall, the young bats can fly and hibernation has not yet begun.

The use of chain saws or heavy equipment could create ground vibrations that may cause noise and tremor disturbance significant enough to cause temporary or permanent roost abandonment. However, machinery used for mechanized treatment would disturb most tree-roosting bats (potentially cause them to flee the area) prior to tree removal activities, and therefore reduce the potential for direct mortality of these species. On the other hand, if activities were to take place during the spring and early summer, juvenile bats, prior to initiation of flight skills, would have no means of escaping direct disturbance and would perish if maternity roosts were abandoned. If bats are roosting in trees that are not felled (trees 30 inches dbh or greater), or trees adjacent to the treatment area, temporary or permanent roost abandonment could also result in lowered reproductive success or even worse, total maternity roost abandonment and death of the young of the year. Direct effects are expected to be low.

Indirect Effects. Implementation of Standard Management Requirements, and/or Resource Protection Measures and mitigations would minimize indirect effects on bats by minimizing effects on foraging habitat and prey species in RHCAs. Also, bats primarily forage at dusk or night when project activities would be minimal or not occurring.

Western red bats are more dependent on riparian habitat for roosting and foraging, and Townsend's big-eared bats are more closely associated with structures (such as caves, bridges, and buildings) for roosting and riparian habitat for foraging. It is expected that disturbances due to activities versus habitat modification would likely affect western red and Townsend's big-eared bat species.

It is difficult to determine where bats are roosting and foraging because of their small stature and difficulty surveying for them. Ground disturbances, caused primarily by mechanical treatments but also by prescribed fire, may change prey populations or their availability as food, either positively or negatively, in areas outside of riparian habitat. This would have a greater impact on pallid bats since they also forage on shrubs and on the ground. The available insect prey base for bats may have some short-term site-specific reductions following treatment due to direct mortality and/or loss of vegetation. However, post-treatment conditions have been shown, in many instances, to increase plant

vigor (Lyon and Stickney 1976; Debyle 1984; Stein et al. 1992). It has also been shown that many herbivorous insects preferentially feed on, and have increased reproductive success and fitness on, more vigorous plants and plant parts, as described by "the plant vigor hypothesis" (Price 1991; Spiegel and Price 1996). Therefore, post-treatment conditions may increase the forage base available to pallid bats. Because the three sensitive bats are insectivores, the felling of snags and removal of logs may reduce the amount of microhabitat available for wood-boring beetles and other insect species that may be used as prey. Impacts would be minimized by following the management requirements for downed woody materials and snag retention.

"Tree roosting has been documented in large conifer snags . . . and bole cavities in oaks" (Sherwin, pers. comm. 1998). Cavities in broken branches of black oak are very important, and there is a strong association with black oak for roosting (Pierson, pers. comm. 1996). Bat foraging habitat is protected under the HFQLG Act final EIS and SNFPA final EIS Record of Decision standards and guidelines protecting aquatic and riparian zones. See the "Silvicultural Report" for information about black oak retention. Logging and prescribed fire would result in a loss of snags that are important for wildlife; however, snag recruitment is also expected with retention of conifers over 30 inches dbh and some recruitment due to fire kill. The recommended standards and guidelines for snag retention (from table 2, page 69 of the SNFPA Record of Decision) would be followed for this project. Indirect effects are expected to be low.

Cumulative Effects. Cumulative effects on these bat species would occur predominately from loss of quantity and quality of habitat (conifer, oak, and riparian) as a result of tree removal and disturbance during roosting attempts and of prey base. Overall, increases in urbanization, recreational use of National Forest System lands, and use of natural resources on state, private, and federal lands may contribute to habitat loss for this species. High-intensity stand-replacing fires, and the methods land managers use to control them, have contributed, and may continue to contribute, to loss of habitat for these species. Activities that result in disturbance to maternal dens or wintering roosts can result in total loss of bat populations within a large area due to the isolated distribution of these sites across the tri-forest area (Plumas, Lassen, and Tahoe National Forests). However, DFPZ maintenance is not likely to result in direct effects and may only result in minor indirect effects, since little maintenance would be conducted in riparian areas. As a protective measure, alternatives F and G do not propose group selection harvests in watersheds over the Threshold of Concern.

With full implementation of Standard Management Requirements and/or Resource Protection Measures and mitigations, cumulative effects on bats would be low because there would be low direct and indirect effects.

3.13.5.28 Alternatives B, E, and F: Effects on Pallid, Western Red, and Townsend's Big-Eared Bats from the Use of Imazapyr to Maintain DFPZs

Based on the herbicide hazard analysis and risk assessment, coupled with the appropriate application procedures, BMPs, and appropriate mitigation measures, the application of imazapyr would have a low risk of adverse effects on small-sized mammal species.

Direct Effects. Direct effects on these species would include the acute exposure for small-sized mammals as a result of direct application as discussed under the Risk Assessment section above. For all herbicides and surfactants, acute exposures are below the LD/LC50s. It is unlikely that bats would be directly sprayed by any herbicides since they do not forage during the daylight hours when herbicides would be applied. Also, herbicide drift would be expected to be much less than any direct exposures, resulting in exposures below adverse effects. Surveys and/or Limited Operating Periods are required for sensitive species, including bats, under the HFQLG Act final EIS, and mitigations would be applied where adverse impacts could occur. Given these conditions, direct adverse effects are not expected on these three bat species.

Indirect Effects. Indirect effects on these species would include the acute doses for small-sized mammals as a result of herbicide application as discussed under the Risk Assessment section in the HFQLG Act final supplemental EIS BA/BE. The analysis uses a small placental mammal (a mouse) and extrapolates what the doses could be from consuming contaminated insects. All doses are below the LD/LC^{50}s. Mice have a slow-moderate metabolism and eat approximately 20 percent of their body weight daily (EPA 1988). Bat species are different than other small mammals (such as mice) in that they have a very high metabolism and can consume up to 100 percent of their body weight in a single night feeding, thereby magnifying any potential adverse effects (Pierson 2003; Brown 2003; Heady, pers. comm. 2003). Possible acute doses are based on conservative assumptions such as high residue rates and 100 percent consumption of contaminated insects.

Riparian habitat is not the vegetation type targeted for treatment, with the exception of potential noxious weed sites for DFPZ maintenance. Dispersed aquatic sites (seeps, springs, and large depressions) are being found highly attractive to bat species not so tightly associated with riparian habitat and may prove to be very important to bat species associated with interior forests (Heady, pers. comm. 2003). These sites should be adequately protected by following SNFPA standards and guidelines for aquatic/riparian areas (refer to Aquatic and Riparian Associated Species sections).

Western red bats are tightly associated to riparian habitat for locating their maternity roosts, as well as for foraging (Pierson, pers. comm. 2003). Direct adverse effects are not expected. This species is solitary in nature and tend to disperse their foraging within riparian zones, dispersed aquatic sites, or forested areas. Females and young are more closely associated with riparian zones for foraging. Insects of target are primarily those in the mid-upper forest canopy (Pierson 2003 and Brown 2003, pers. comm.). Based on the above, it is unlikely that any maternity colonies would be indirectly adversely affected.

Townsend's big-eared bats are tightly associated to structures (such as caves, mines, bridges, and abandon buildings) for locating their maternity roosts. Suitable roosting structures would be evaluated for active roosts and protected as necessary. Direct adverse effects are not expected. This species is solitary in nature, tends to disperse their foraging within the mid-upper canopies of forested areas, and are relatively hard to locate while foraging. However, they have been known to use gullies for foraging (Pierson, pers. comm. 2003). Based on the above, it is unlikely that any whole colony would be indirectly adversely affected.

Pallid bats are colonial, individual populations roosting and foraging together, in nature. This bat species forages usually within a 0.25 mile of their roost sites and has night roosts close to or within their feeding sites (Pierson 2003 and Brown 2003, pers. comm.). They exhibit a feeding pattern

different from most bats in that they feed on foliage or on the ground for prey such as crickets, beetles, grasshoppers, moths, cicadas, centipedes, and scorpions. During the day, a *Ceanothus* brushfield could be sprayed with triclopyr, and the residing grasshoppers contaminated. That same night, a pallid bat colony could arrive at the site to forage for grasshoppers. The pallid bat may stay at this site and forage until the grasshoppers are exhausted, or they are done feeding for the night. They could possibly return to the same *Ceanothus* brushfield site the next night to forage on the same herbicide-contaminated grasshoppers.

It is possible that whole colonies could be adversely affected with herbicides and surfactants; however, based on the following factors, adverse indirect effects are not expected. Exposure to insects that may be hidden in foliage or soil would be greatly reduced compared to those insects in the open that may be directly sprayed. Insects that are not directly sprayed, but rather are exposed to herbicide drift, would also see considerably less exposure than from direct spray. Surveys would be conducted where herbicide and surfactants would be sprayed in potential foraging habitat for the pallid bat, and mitigations would be applied to protect the species from any potential adverse effects. A similar or greater reduction would be expected in other food sources, such as insects that would not be subjected to a liquid spray. Other mitigations (such as herbicide selection, lower application rates, avoid areas, and Limited Operating Periods) would be applied.

Cumulative Effects. By adhering to management directions, standards and guidelines, BMPs, and mitigation, direct and indirect effects are not expected, therefore cumulative effects are not expected to occur.

3.13.5.29 Alternatives B, D, and F: Effects on Pallid, Western Red, and Townsend's Big-Eared Bats from Triclopyr BEE for Noxious Weed Control

Based on the herbicide hazard analysis and risk assessment, with the appropriate application procedures, best management practices and appropriate mitigation measures, the application of triclopyr BEE should have a low risk of adverse effects on small-sized mammal species.

For site-specific projects, evaluate and implement design features to reduce indirect and cumulative effects to the western red bat, Townsend’s big eared bat, and pallid bats. If bats are located, consider buffers around roosts, limiting operating periods and reduced application rates. Herbicides will be applied using a back-pack with a wand to help reduce factors that could potentially expose the roost site to herbicides.

Alternatives B, D, and F may cause vegetation disturbance. Negative effects from direct or indirect mortality and/or loss of vegetation pose a threat to available insects, which is a prey base for bats.

Direct, Indirect, and Cumulative Effects. Refer to the discussion above for imazapyr.

Triclopyr BEE is proposed to control 31 acres of noxious weeds, including several species of broom. Broom plants are in dense clumps and are not roosting or denning habitat. Broom plants would be treated by direct spray; the expected herbicide drift is 50 feet. Aquatic and riparian habitat

would be avoided. Perennial fish-bearing streams would have 300-foot buffers, and perennial nonfish-bearing and intermittent streams would have a minimum 150-foot buffer with no herbicide application. Direct, indirect, and cumulative effects are not expected.

3.13.5.30 All Action Alternatives: Effects on Hardhead Minnow from DFPZ, Group Selection, and Individual Tree Selection

The major differences between alternative A and the action alternatives are from proposed activities and future activities on private land. It has been determined that the direct, indirect, and cumulative effects on the aquatic systems would be the same for all action alternatives; thus again, the alternatives were analyzed together. The subwatersheds approaching or over the Threshold of Concern are listed in tables 3-33 and 3-36 in the "Hydrology" section (3.8) of this EIS. A comparison of ERA scores in relation to the Threshold of Concern for each alternative is included in table 17 of the "Slapjack Hydrology Report."

Direct Effects. Activities proposed under the Slapjack Project would not directly affect hardhead minnows since this species inhabits large river and lake habitats, and most project activities are confined in the upper watersheds adjacent to smaller drainages. Perennial, intermittent, and ephemeral streams occur within the project area. Overall, very little change in structure of the riparian vegetation is expected due to minimal activities within the RHCAs. Most trees providing cover to aquatic and riparian habitats would be retained.

There would be minimal direct effects from DFPZ construction, group selection, and individual tree selection on hardhead minnows and MIS fish species because these vegetation management activities would occur mostly outside of RHCAs. No group selection or individual tree selection would occur within the RHCAs, and skid trails would only cross ephemeral dry streambeds. No group selection skid trails would cross streams with running water. In addition, it is expected that none of the skid trails associated with DFPZ construction would cross RHCAs. Consequently, direct effects due to skidding are expected to be minimal. All riparian protection standards apply to the action alternatives. Scientific Analysis Team guidelines and associated Riparian Management Objectives (RMOs) would be met with the action alternatives. All applicable BMPs and Soil Standard Protection Measures would be instituted.

Under the action alternatives, there is potential for direct effects on hydrologic function from prescribed vegetation management activities. However, this potential can be eliminated or entirely mitigated by the application of the required standards and guidelines, including all applicable BMPs, as listed above in the "Regulatory Framework" section. Standards and guides and BMPs are designed to severely limit the scope and intensity of management activities in channel and riparian corridors, and to provide maximum protection to these features. Designation of RHCAs and limitations on mechanical entry to RHCAs should essentially negate the threat of direct effects on watershed condition from DFPZ treatments.

Indirect Effects. Mechanical treatments are not proposed within riparian areas. Where low ground-pressure equipment is used, sufficient ground surface cover would be retained to prevent erosion. There are no anticipated indirect effects from mechanical treatments. Construction of a DFPZ would be distant from perennial waters and would not create indirect effects on aquatic species or

their habitats. Planting and replanting do not create ground disturbance sufficient to produce indirect effects on aquatic species or their habitats. Thinning of existing conifer stands would not contribute to erosion or affect riparian vegetation, and is not likely to create indirect effects on hardhead minnow species or their habitats. Underburning treatments would not result in soil conditions likely to increase erosion. Post-fire runoff can result in nutrient pulses in streams, contributing to increased productivity (Pilliod et al. 2003). Pile burning would not occur near streams and is not likely to contribute to sediment or nutrient loading.

Road building and their continued use have the potential to be the largest contributor of surface erosion and sediment delivery. Early erosion and sediment modeling in the Idaho Batholith (Gray and Megahan 1981) concluded that a standard 16-foot road on a 5–7 percent grade, could produce 67,500 tons per square mile of eroded material after the first year of construction, declining to a steady state rate of 5,000 tons per square mile after 3 years. The proposed 18 miles road decommissioning and 8 miles of road closures of roads in the project area would reduce erosion and sedimentation and mitigate increased sediment to downstream hardhead habitat that could be produced by the proposed new road construction under alternative B.

In the project area, six culverts have been identified for upgrades. Implementation of the proposed fish passage improvement projects would provide approximately 2 miles of high-quality fish spawning and rearing habitat. Improvement of these culverts would also reduce downstream erosion and improve water quality by reducing the scour and plunge pool development from undersized culverts.

The SAT guidelines and BMPs would be followed. Implementation of BMPs designed to minimize upslope erosion should serve to minimize sedimentation of the streambed and subsequent degradation of downstream aquatic habitats. The Cumulative Watershed Effects Analysis (CWE) states there would be no measurable downstream effects on beneficial uses due to sediment from the proposed project, thus minimal indirect effects on fish species will occur downstream (refer to the Hydrology Report).

Cumulative Effects. It is unlikely that the proposed activities would be a significant addition to cumulative effects, given that RHCAs would be maintained, very few new roads would be constructed, and miles of roads have been proposed for decommissioning or closure. The application of BMPs and RMOs would provide additional protection for this species.

Urban development may continue downstream of the project area, within the Oroville Basin to the southwest of the project boundary, which would continue to sustained bank down-cutting and sedimentation into the North Fork Feather River. All proposed Slapjack Project activities have minimal potential to affect hardhead and trout species or their habitat.

The active grazing allotments would continue to contribute sustained bank down-cutting and sedimentation. The Slapjack Project would not result in any changes from the existing sedimentation or bank cutting caused by livestock.

3.13.6 Determinations

The proposed activities in the Slapjack Project area may have some affects on habitat for MIS and/or NTMB species. Refer to appendix B in the BA/BE for discussions of the potential effects on the habitat for these species.

The following are determinations for federal Threatened, Endangered, and Sensitive species based on current available data and on the following assumptions: full implementation of identified mitigations and complete compliance with the Pumas National Forest Land and Resource Management Plan, and all applicable amendments, including HFQLG Act final supplemental EIS and Record of Decision and the SNFPA final EIS and Record of Decision (table 18).

Based on the above analysis of the proposed project and treatments in the Slapjack Project area, it is the Forest Service determination that the activities would not affect the following federally Threatened or Endangered: valley elderberry longhorn beetle, Carson wandering skipper, delta smelt, Lahontan cutthroat trout, winter-run Chinook salmon, Central Valley spring-run Chinook salmon, or Central Valley steelhead. These species do not occur within the elevational range of the project area, do not occur in the project area, or have not been located by surveys. Also included are those species for which the following were developed: Resource Protection Measures, Best Management Practices, Scientific Analysis Team guidelines and associated RHCAs and RMOs, and applicable standards and guidelines contained in the HFQLG Act final EIS and Record of Decision and the SNFPA final EIS and Record of Decision.

It is the Forest Service determination that the proposed activities in the Slapjack Project area may affect, but are not likely to adversely affect the California red-legged frog, which is a federally Threatened species.

It is the Forest Service determination that the proposed activities in the Slapjack Project area would not affect the bald eagle, which is a federally Threatened species.

If any federally listed species are found at a later date, or if any new information relevant to potential effects of the project on these species becomes available, the project would be stopped and the Section 7 Consultation process under the *Endangered Species Act* would be initiated.

It is the Forest Service determination that the proposed activities in the Slapjack Project area would not affect the following Forest Service Sensitive species: little willow flycatcher, great gray owl, Sierra Nevada red fox, northern leopard frog, greater sandhill crane, Swainson's hawk, peregrine falcon, mountain yellow-legged frog, great gray owl, American marten, and California wolverine,

It is the Forest Service determination that the proposed activities in the Slapjack Project area may affect individuals, but are not likely to result in a trend toward federal listing or loss of viability for the following Forest Service Sensitive species: northwestern pond turtle, foothill yellow-legged frog, California spotted owl, northern goshawk, hardhead minnow, Pacific fisher, pallid bat, Townsend's big-eared bat, and western red bat.

3.13.7 Past, Present, and Reasonably Foreseeable Future Actions

Terrestrial Habitat. Under the *National Environmental Policy Act* (NEPA), "cumulative effects represent the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."

The cumulative effects of the Slapjack Project on fish and wildlife species include past, present, and reasonably foreseeable projects occurring in and adjacent to the Slapjack Project analysis area, which includes 25,000 acres of public and private land. Past activities are considered part of the existing condition and are discussed in the "Affected Environment (Existing Conditions)" and "Environmental Consequences" section for each resource. Table 3-60 displays past, current (or ongoing), or reasonably foreseeable future activities in or adjacent to the Slapjack Project area.

Table 3-60. Past, present, and foreseeable future actions in and adjacent to the Slapjack Project area.

Project	Location	Activity	Time Period
Watson Ridge Underburn	Western most portion of Watson Ridge	500 acres of underburn	Past
Watson Thinning	Watson Ridge	100 acres commercial thin; 90 acres biomass thin; mastication; and 25 acres pre-commercial thin	Past
Steward Thinning	Steward Ravine	188 acres of intermediate cut thinning	Past
Brush Creek Fuel Reduction Project	Between French Creek Basin, Bald Rock, and the Middle Fork of the Feather River	690 acres of conifer removal, fencing streambank stabilization	Past
Watershed Improvement Projects	Head of Fall River and Table Mountain Meadow Complexes, Daley Cow Camp and Watson Cabin Meadows	22 acres of conifer removal, fencing, streambank stabilization	Past
Upper Slate DFPZ	Slate Creek Watershed	1,774 acres	Past
Lower Slate DFPZ	Slate Creek Watershed	3,510 acres	Past
South Fork DFPZ	Mooreville Ridge	31 acres mechanical removal of fire-killed trees; 840 acres mechanical thin and biomass removal; 400 acres mastication; and 1,410 acres underburn	Current
Feather Falls Salvage	Private land near Feather Falls	14,314 acres of salvage (harvest of dead, dying, or diseased trees of any size in amounts less than 10% of average volume per acre)	Current
Bald Onion DFPZ	North of Little Grass Valley reservoir	3,175 acres	Current
Bald Mountain	Near Little Grass Valley Reservoir and South Fork Feather River	90 acres group selection; 100 acres individual tree selection	Foreseeable future
Chimney Rock Tie	Chimney Rock: Forest Service and private lands	20 acres of roadway clearing; construction 2.5 miles of new road and decommission 0.5 mile existing road on National Forest land	Foreseeable future
Basin	Granite Basin area	1,215 acres of group selection and 80 acres of individual tree selection	Foreseeable future
Watdog	Watson Ridge area	4,021 acres of DFPZs (including 209.9 acres of group selection) and 230 acres of group selection	Foreseeable future
Range/Grazing	Project area	One active range permit in Fall River grazing allotment	Ongoing

Table 3-60. Past, present, and foreseeable future actions in and adjacent to the Slapjack Project area (continued).

Project	Location	Activity	Time Period
Noxious Weed Treatments	Forest wide	Roadside weed treatments	Foreseeable future
Recreation Projects	N/A	No known recreation projects in recent past or foreseeable future	N/A
Mining Projects	Forest-wide	Multiple	Foreseeable future
Special Use Permits	Forest-wide	Multiple	Foreseeable future

3.13.7.1 Past Actions

Past activities in the area include timber harvest, planting, pre-commercial thinning, herbicide use in plantations, recreation, mining, and grazing. The conditions of the vegetation, streams, wildlife habitat, riparian areas, soils, and meadows in the Slapjack Project landscape today are the product of both natural occurrences as well as post Euro-American settlement activities, dating from the California Gold Rush.

Timber harvesting mostly supplied lumber and timber to ranches and mines in the vicinity. Intensive harvesting on National Forest lands began in the 1930s and continued to the 1990s. From 1917 through 2003, history records of large fires show a total of 58 fires that could have or did affected the Slapjack Project area. Large fires ranged from 100 acres to over 33,000 acres in size, the largest being the ‘49er fire which burned over 33,000 acres and destroyed 148 dwellings and 356 other structures. See the “Fuels Report” for a Forest Service detailed fire history of class A, B, C, and D fires (0.1 acre to 300 acres) listed by watershed and fire cause.

It is understood that this data does not contain all of the fires that actually occurred due to numerous reasons (lack of reporting, differing priorities over the decades, or loss of records), but there is enough data to demonstrate the continuing influence of wildland fire in and surrounding the approximate 27,000-acre Slapjack project area.

The combined effects of past timber harvest and fire exclusion have changed the tree species composition and structure of the forest. The most important effect is the loss of large trees and snags, and the resultant decrease in habitat values for pallid bats, goshawks, forest carnivores, great gray owls, spotted owls, and cavity-dependent species. The structural complexity of a stand comprised of predominately large trees differs from a stand comprised of small trees, even at the same canopy closure. For instance, the closer spacing of limbs in small trees allows less flight space and access into the crowns for nesting and roosting by large birds. Sunlight, moisture, and wind penetration of the stand (the microclimate) are different under a large tree canopy than that of small trees. The crowns of smaller trees are also closer to the ground, making them more susceptible to stand-replacing fires that would detrimentally affect habitat for late serial species. Changes in species composition have mixed effects; in some cases, changes may increase habitat value by increasing structural complexity in the canopy, as well as increasing canopy closure (such as white fir encroachment in pine stands). In other

instances, changes may simplify stand structure (through the loss/reduction of sugar and yellow pines in mixed conifer stands) and increase the likelihood of stand-replacing fires.

3.13.7.2 Present Actions

The primary impact from recreational use is vehicle traffic on roads. The Slapjack Project would not increase overall road densities. The decommissioning of roads would lower the average road density from 5.7 miles per square mile to 5.5 miles per square mile. However, recreational use is expected to increase in the future as additional people recreate in the National Forest. Recreation use would continue to be monitored, and sensitive wildlife areas would be closed to the public, if necessary. If future recreation demands lead to increased off-highway vehicle use or development of additional facilities, there would be a project analysis under the NEPA process.

3.13.7.3 Foreseeable Future

A Record of Decision was signed in July 2003 for the HFQLG Act final supplemental EIS. The Record of Decision documented the results of an environmental analysis of effects of alternative management strategies for maintenance of DFPZs within the HFQLG Pilot Project area. The final supplement EIS and Record of Decision, in combination with the original HFQLG Act final EIS and Record of Decision, provide programmatic guidance for DFPZ construction and maintenance in the HFQLG Pilot Project area. The DFPZ maintenance methods were developed from criteria in the final supplement EIS involving land allocations, slope classes, and vegetation characteristics.

The Record of Decision for the HFQLG final supplemental EIS calls for consideration of all practicable methods of vegetation control for site-specific projects, including the use of herbicides. As pointed out in the supplemental EIS, herbicides have been shown to be most efficient and effective in delaying or preventing the buildup of understory fuels when used within about two years of the initial treatment. Because alternatives C, D, and G do not propose herbicide use for preventive maintenance of the DFPZs, herbicide use for DFPZ maintenance in the foreseeable future is essentially precluded under these alternatives. For these alternatives, an underburn would be the final treatment where DFPZ objectives are not met with mastication. In the long term, based on site-specific analysis of land allocations, slopes, vegetation types, and previous underburning treatments (stands 1, 9, 15, 19, and 23) in the Slapjack Project area, the foreseeable maintenance of the DFPZ would consist of prescribed fire, mechanical treatments (mastication, grapple pulling), and hand treatments.

About 20 percent of the area in the proposed segments of the Slapjack Project DFPZs is in plantations. After the completion of the mastication proposed for these areas, manzanita, *Ceanothus*, and other shrub species may re-sprout and begin reducing DFPZ effectiveness within five years of the initial treatment. However, young shrubs, especially *Ceanothus* species common in the area, have a high percentage of live material that maintains high fuel moisture content throughout the year. Younger shrubs are less flammable than older shrubs, since younger shrubs have a lower proportion of dead to live branches than older shrubs. In addition, shrubs with high fuel moisture content can act as a heat sink by absorbing some of the heat produced by adjacent burning fuels without igniting themselves, thereby retarding fire spread. As an example, the Mosquito fire in August 1999 started from a lightning strike adjacent to a similar nine-year-old plantation of primarily ponderosa pine with

a high component of *Ceanothus* shrubs. A fireline was quickly constructed through the middle of the plantation, and the fire was controlled at about 30 acres by one engine crew and a dozer.

The remaining 80 percent of the project area is made up of more natural stands of larger sized trees, where the vegetation has not been as intensively treated. After thinning, biomass removal, mastication, and burning proposed in this project are completed, some slow to moderate development of manzanita, *Ceanothus*, and other shrubs would occur, and in some areas, grasses would become more vigorous and dense. As the overstory canopy cover increases, shrub growth would begin to be suppressed, and overall shrub cover would decrease. Since mastication would not change canopy levels, or only change them slightly, these units would have the least understory. Over time, there would also be some natural regeneration of conifers, which could reduce DFPZ effectiveness by creating fuel ladders within 10 to 20 years after the initial treatment, depending on the site.

Even if no maintenance is conducted in these DFPZs in the future, the DFPZs should be effective for many years. In the natural stands, the DFPZs' effectiveness should not be seriously reduced for 10 to 20 years. In the plantations, the DFPZs' effectiveness should not be reduced for approximately 5 years. And, after these periods, the DFPZs would retain many of their beneficial characteristics (increased overstory crown spacing, reduced ladder fuels) for fighting fire and reducing fire intensity. For example, even if significant amounts of understory vegetation grow in the treated stands over the next several years, the proposed action would remove a significant amount of ladder fuel, such that the net amount of fuel would be reduced over time. Additionally, should there be a situation where a DFPZ has not been maintained for several years, but the Forest Service determines that the DFPZ would provide a safe position from which to fight an oncoming wildfire, Forest Service staff could conduct emergency maintenance at the time of the wildfire, such that the DFPZ would regain full effectiveness by the time the fire reached the area.

DFPZ, group selection, and individual tree selection projects are scheduled for areas adjacent to the Slapjack Project and at other locations within the Feather River Ranger District. The Upper and Lower Slate DFPZs are currently being implemented. The Upper Slate DFPZ is approximately 1,774 acres, and the Lower Slate DFPZ is approximately 3,510 acres. Analyses of the Upper and Lower Slate projects concluded that impacts on California spotted owls and other Forest Service Sensitive species were minimal. The South Fork DFPZ (1,803 acres) and Bald Onion DFPZ (3,175 acres) are also being implemented now, and the impacts are expected to be similar to the Slate projects. Implementation of the Brush Creek DFPZ project (2,044 acres) was initiated in 2005. The Basin Project, consisting of 1,215 acres of group selection and 80 acres of individual tree selection, is scheduled for implementation beginning in 2006. The Watdog Project includes 4,021 (including a maximum of 202.9 acres of group selection) acres of DFPZ and 28.5 acres of group selection outside of DFPZs and is scheduled for implementation in 2006. The Bald Mountain Project, with group selection (1,675 acres) and individual tree selection (190 acres), is scheduled for implementation in 2006. The Flea and Sugarberry projects propose group selection and DFPZ construction with a proposed implementation date of 2007. All of the projects discussed in this paragraph are HFQLG Act Pilot Projects.

3.13.8 Summary of Cumulative Effects

The cumulative effects of this project on fish and wildlife species include those effects from past, present, and reasonably foreseeable projects occurring in and adjacent to the Slapjack Project area, which includes 22,939 acres of National Forest System land. Past activities are considered part of the existing condition and are discussed in the "Affected Environment (Existing Conditions)" and "Environmental Consequences" sections for each resource.

California Red-legged Frog. By adhering to management directions, standards and guidelines, Best Management Practices, and mitigations, direct adverse effects are not expected and indirect effects are expected to be low. Cumulative adverse effects are also expected to be low.

Northwestern Pond Turtle. By adhering to management directions, standards and guidelines, Best Management Practices, and mitigations, impacts on turtle habitat would be prevented or strictly controlled, and habitat restoration and enhanced connectivity could result from proposed activities (including DFPZ) maintenance. The proposed activities in the Slapjack Project would not result in direct effects but could result in low indirect effects. There would also be no incremental cumulative effects on the northwestern pond turtle.

Bald Eagle. By adhering to management directions, standards and guidelines, direct and indirect effects are not expected, therefore cumulative adverse effects are not expected to occur.

California Spotted Owl. By adhering to management directions, standards and guidelines, Best Management Practices, and mitigations, direct, indirect, and cumulative adverse effects are expected to be low.

Northern Goshawk. By adhering to management directions, standards and guidelines, Best Management Practices, and mitigations, direct adverse effects are not expected and indirect effects are expected to be low. Cumulative adverse effects are not expected to occur. Habitat suitability is expected to increase as a result of the proposed treatments in the Slapjack Project area.

Great Gray Owl. By adhering to management directions, standards and guidelines, Best Management Practices, and mitigations, direct, indirect, and cumulative adverse effects are not expected.

Little Willow Flycatcher. By adhering to management directions, standards and guidelines, Best Management Practices, and mitigations, direct, indirect, and cumulative adverse effects are not expected.

Pacific Fisher. By adhering to management directions, standards and guidelines, Best Management Practices, and mitigations, direct effects are not expected, and any indirect and cumulative effects would be low.

Pallid, Western Red, and Townsend's Big-eared Bat. By adhering to management directions, standards and guidelines, Best Management Practices, and mitigations, any direct, indirect, and cumulative adverse effects are expected to be low.

3.14 Short-Term Uses and Long-Term Productivity

The Council on Environmental Quality regulations for implementing the *National Environmental Policy Act* (NEPA) require consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

All the action alternatives are expected to implement ground-disturbing activities through mechanical thinning, group selection harvest, individual tree selection, mastication, hand thinning, prescribed burning, and road work and other activities associated with fuel treatments. These activities would produce short-term effects on soil, water quality, and wildlife habitat, as described in each resource's "Environmental Consequences" section in this chapter. There would be a short-term gain in shrubs, brush, and forage for deer and other wildlife after thinning the natural stands and plantations and reducing the density of the canopy. However, once the canopy cover closes again, there would be a decrease in the amount of understory vegetation. Prescribed burning would change stand structure by burning the understory vegetation and the suppressed and intermediate tree sizes, but the larger vegetation that is not consumed by the prescribed burn would be left standing. Some stands would still experience some stress after treatment due to competition with brush species that were not consumed in the underburn treatments. Ground disturbances, caused primarily by mechanical treatments but also by prescribed fire, could increase plant vigor and tree growth, creating additional habitat or improving existing habitat for certain wildlife species in the long term.

All action alternatives would reduce fuel loads and the potential for a large and intense wildlife. A large wildfire could induce the formation of hydrophobic (not absorbing or easily mix with water) soil layers, which would lead to increased runoff and erosion in the short term. The potential risk of cumulative watershed effects from stand-replacing wildfire would greatly exceed the short-term risk of cumulative watershed effects that would occur from proposed treatments.

Herbicide use would have no effect on short-term use or long-term productivity for the human health environment. Soil cover would likely increase as a consequence of herbicide application. Plant material that is left on-site after herbicide application would become available for organic matter, as opposed to being removed from the ecosystem if biomass treatments are performed. There may be some short-term reductions in the herbaceous component of ground cover, but this is typically a minor component of overall ground cover in most areas. Any short-term loss of nitrogen availability from the death of nitrogen-fixing plants, such as broom or *Ceanothus* species, would be replaced by the incorporation of dead vegetation in the soil and the greater availability of solar energy for plant material decomposition. Herbicide application does not affect soil porosity.

3.15 Unavoidable Adverse Effects

Alternative design and prescribed resource protection measures are intended to minimize potential adverse impacts on resources in the project area. However, to move resources to desired conditions, some unavoidable adverse effects may result. The potential risks associated with noxious weed spread are described under “Environmental Consequences” in each resource section of this chapter.

No unavoidable adverse effects are expected on human health and safety because herbicide Best Management Practices and management requirements would be implemented (see appendix F). Accidental spills may cause some short-term adverse impacts on individual aquatic, botanical, and wildlife species.

Each of the action alternatives may result in a short-term minor loss of some riparian vegetation and hardwoods from the thinning and fuel reduction treatments. Since various elements within the ecosystem are linked to each other, activities proposed in this project may affect fungi, bacteria, mycorrhizae and a variety of other ecosystem processes, but these effects are expected to be minor and of short duration.

There may be some unavoidable adverse effects on native plants, which could be displaced as weeds spread. However, the noxious weed control program for the Slapjack Project would incorporate multiple control tactics to minimize potential weed spread and would not rely on any one tool. The use of multiple tools may increase the probability of eradication by permitting continued treatment over a longer period of time. For example, broom seedlings can be hand pulled and burned with backpack torches in the early spring. In the summer and fall, these tactics are not practical because of fire risk and hard soil. Brush cutters and string trimmers could be used during summer and fall to cut plants when they are water-stressed. When fire danger restricts the use of motorized string trimmers, herbicides could be used to control broom seedlings.

Implementation of Standard Management Requirements and Best Management Practices would help avoid loss of soil cover, soil porosity, and organic matter resulting from treatments.

Smoke may affect air quality to some degree while prescribed fire activities occur. Prescribed fire activities would be accomplished with an approved smoke management plan.

The project activities may result in some unavoidable adverse effects on wildlife species; these effects would include immediate changes in habitat conditions, disturbance or harassment, or direct mortality. It is assumed in this analysis that all action alternatives would be implemented as stated, and would be in compliance with all laws and regulations governing land management activities, including the use of Limited Operating Periods. Direct disturbance, including mortality to individual species (see the Biological Assessment / Biological Evaluation for the Slapjack Project), is unlikely due to survey efforts for selected species, incorporation of Limited Operating Periods where appropriate, and implementation of standards and guidelines contained in the 1988 *Plumas National Forest Land and Resource Management Plan*. However, mortality could occur as a result of tree removal, mastication, and prescribed burning, particularly if roosting, nesting, or denning trees are removed.

3.16 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

Air Quality

Alternative A – Possible irreversible air quality impacts are health effects on humans and wildlife caused by unplanned and unmitigated wildfires. Smoke with particulate matter (PM_{10} and $PM_{2.5}$) in concentrations above the National Ambient Air Quality Standards is a known hazard to the young, people with certain health conditions, and certain wildlife species (Sandberg et al. 2002). Emissions from wildfire are estimated to be 200 percent greater than emissions from prescribed burning. In addition, because wildfires typically burn for a longer period of time under highly variable weather conditions, wildfires are more likely to impact air quality in populated areas than do prescribed burns.

Alternative B – No irreversible impacts on air quality are expected. Irretrievable impacts, including a temporary loss of scenic views and poor air quality that temporarily affects human quality of life, may occur for limited periods of time as a result of prescribed burning and other operations. These effects would vary depending on the extent of prescribed burning on any given day and weather conditions during the burn period.

Botanical Resources. There would be no irreversible or irretrievable commitments of botanical resources.

Fire and Fuels. There would be no irreversible commitments of resources from the action alternatives because the effects of these alternatives on fuels and fire behavior would be temporary in duration and would not be as severe as those of a wildfire.

Economics. There would be no irreversible or irretrievable effects on the economic environment.

Heritage Resources. There would be no irreversible or irretrievable commitments of heritage resources.

Humans Health and Safety. There would be no irreversible and irretrievable commitment of resources from implementation of herbicide applications for DFPZ maintenance or noxious weed control.

Hydrology and Fish

Alternative A – There would be no project-related direct, indirect or cumulative effects under the no-action alternative, hence there would be no irreversible or irretrievable commitments of riparian or water resources.

All Action Alternatives – While the action alternatives could result in short-term effects on hydrologic response in the affected watersheds, the effects are not projected to cause irreversible or irretrievable commitments of riparian or water resources.

Recreation. There would be no irreversible or irretrievable effects on recreation, lands, visual resources, or minerals.

Soils. There would be no irreversible or irretrievable effects on soil productivity associated with the action alternatives.

Vegetation

Alternative A – There would be an irretrievable loss of growth on the larger overstory trees from not thinning the understory or the suppressed and intermediate trees.

All Action Alternatives – There would be an irretrievable loss of growth from the natural and planted seedlings within the group selection areas as a result of retaining trees larger than 30 inches dbh.

Wildlife. There would be no irreversible or irretrievable commitments of wildlife resources.

3.17 Other Required Disclosures

The Council on Environmental Quality regulations for implementing the *National Environmental Policy Act* (NEPA) direct that "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with . . . other environmental review laws and executive orders" (40 CFR 1502.25(a)).

3.17.1 Endangered Species Act

Informal consultation occurred with the U.S. Fish and Wildlife Service regarding federally Threatened, Endangered, or Proposed species that are expected to occur within the analysis area for this proposal. Details of this consultation are found in chapter 4, section 4.1.2, of this document

3.17.2 Clean Water Act

Compliance with the *Clean Water Act* would be accomplished through implementation of the Best Management Practices (BMPs) for National Forests in California. These BMPs are listed in appendix F of this document.

3.17.3 Clean Air Act

Whenever prescribed fire is used, smoke management and air quality would be emphasized. The Forest Service will comply with the Interim Air Quality Policy on Wildland and Prescribed Fires, announced by the EPA in 1998; the Memorandum of Understanding between the California Air Quality Board and the USDA Forest Service, signed on July 13, 1999; Title 17 of the 2004 California Air Pollution Control Laws and Interim Air Quality Policy; and local smoke management programs.

3.17.4 National Historic Preservation Act

The Forest Service is complying with the provisions of the programmatic agreement between the USDA Forest Service, Pacific Southwest Region; California State Historic Preservation Office; and the Advisory Council on Historic Preservation regarding the identification, evaluation, and treatment of historic properties managed by the National Forests of the Sierra Nevada, California.

3.17.5 National Forest Management Act

The Forest Service is complying with the provisions of this law (see appendix G of this EIS for the findings). The following executive orders, which apply to the proposed action and alternatives, provide direction to federal agencies

Consultation and Coordination with Indian Tribal Governments, Executive Order 13175 of November 6, 2000 – The following federally recognized tribes and interested and affected tribes were consulted regarding the Slapjack Project: Mooretown Rancheria, Enterprise Rancheria, Berry Creek Rancheria, Chico Band of Mechoopda Indians, and the Konkow Valley Band of Maidu. No concerns were raised during consultation.

Indian Sacred Sites, Executive Order 13007 of May 24, 1996 – There are no known sacred sites within the heritage resources analysis area for the Slapjack Project area.

Invasive Species, Executive Order 13112 of February 3, 1999 – Section 3.3 of this document addresses botanical resources and noxious weeds. Mitigation measures, project design, and standard management practices considered both the introduction and spread of invasive species. The project includes a noxious weed control program that incorporates multiple control tactics.

Recreational Fisheries, Executive Order 12962 of June 6, 1995 – The Slapjack Project is designed to improve the quantity, function, sustainable productivity, and distribution of aquatic resources for increased recreational fishing, as per Executive Order 12962, by

- incorporating Scientific Analysis Team standards and guidelines through designation of Riparian Habitat Conservation Areas on all ephemeral, intermittent, perennial, and fish-bearing perennial streams within the project area; and

- conserving and restoring aquatic systems that support recreational fisheries by upgrading or replacing six culverts.

Migratory Birds, Executive Order 13186 of January 10, 2001 – In 2001, Executive Order 13186 was issued to outline responsibilities of federal agencies to protect migratory birds under the *Migratory Bird Treaty Act* (66 FR 3853-3856), including evaluating the effects of federal actions and agency plans on migratory birds through the NEPA process. Migratory birds have been addressed in this EIS and the supporting "Management Indicator Species Report" (an appendix to the BA/BE). This order also directs federal agencies to work with the U.S. Fish and Wildlife Service to promote conservation of migratory bird populations.

Floodplain Management, Executive Order 11988 of May 24, 1977 – Protection of Wetlands, Executive Order 11990 of May 24, 1977 – These federal executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be assured by incorporating the project Riparian Management Objectives (RMOs), adhering to the Scientific Analysis Team guidelines as set forth in the HFQLG final EIS and Record of Decision, and implementation of BMPs, standard management practices, and project design criteria.

Environmental Justice, Executive Order 12898 of February 11, 1994 – In February 1994, President Clinton signed an Executive Order on environmental justice, requiring federal agencies to conduct activities related to human health and the environment in a manner that does not discriminate or have the effect of discriminating against low-income or minority populations. Although low-income and minority populations live in the vicinity, activities proposed for the Slapjack Project would not discriminate against these groups. Based on the composition of the affected communities and cultural and economic factors, proposed activities would have no disproportionately adverse effects on human health and safety or environmental effects on minorities, low-income, or any other segments of the population. Scoping was conducted to elicit comments on the proposed action from all potentially interested and affected individuals and groups without regard to income or minority status.

Use of Off-Road Vehicles, Executive Order 11644 and 11989, amended May 25, 1977 – The Slapjack Project is designed to comply with Executive Orders 11644 and 11980.

- A roads analysis was conducted by the Interdisciplinary Team during project planning to determine disposition of system roads. The analysis resulted in the road system treatments proposed for the Slapjack Project (see section 3.11 of this EIS). The proposed treatments are needed to bring existing system roads into compliance with current maintenance standards; provide access to vegetation and fuel treatment areas; reduce erosion, compaction, and sedimentation; reduce impacts on wildlife; and provide for public safety.

- Through project planning, the public was given an opportunity to participate and comment on proposed road closures and decommissioning. The Plumas National Forest is currently undergoing an OHV route inventory and designation process. Roads proposed for decommissioning or closure under the Slapjack Project would not be closed until the OHV process has been completed, unless the following criteria apply: (1) dead-end spurs or routes that show no evidence of OHV use, which are contributing to resource damage; (2) user-created routes in areas that are already closed by existing Forest Orders; (3) routes that are creating unacceptable resource damage to the extent that a delay in their closure would result in unacceptable and irretrievable impacts on the resource. The Interdisciplinary Team identified three road segments totaling approximately 1.5 miles that meet the criteria listed above. See section 3.11 (“Transportation System”) for more information.

Chapter 4: Consultation and Collaboration

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Chapter 4. Consultation and Collaboration

4.1 Preparers and Contributors

The Forest Service consulted the following individuals; federal, state, and local agencies; tribes; and non-Forest Service persons during the development of this environmental impact statement:

4.1.1 Interdisciplinary Team Members

Name	Title	Education / Responsibility / Experience
Joanna Arroyo	Wildlife Biologist	MS in Wildlife Management and BS Wildlife Management, New Mexico State University, Las Cruces, New Mexico; 3 years of combined experience in wildlife.
Rick Case	District Fuels Specialist	Fire and fuels – 25 years of experience.
Deirdre Cherry	Fuels Technician	BS in Athletic Training, Boise State University, ID; 15 years of experience in fire and fuels.
Linda Christian	Planner	BS Forestry, Humboldt State University; 21 years of Forest Service experience.
Chris Christofferson	Assistant District Botanist	BS in Biology, with an emphasis in Ecology, California State University, Chico; MS in Integrated Pest Management, University of California, Davis; 6 years of experience in botany.
Jerry Gott	District GIS Coordinator	BA in Natural Sciences, California State University, Chico; AA in English, Shasta College; 6 years of experience in GIS; 21 years of experience in timber sale planning, preparation, and administration; 4 years of experience in fire management (Helitack); 2 years of experience in recreation (trails).
Pete Hochrein	Forest Transportation Engineer	BS in Forest Resource Management, University of California, Berkeley; MS in Forestry, Oregon State University; 26 years of Forest Service experience.
Kristina Hopkins	Forest Fisheries Biologist	Plumas National Forest.
Susan Joyce	Planner	BS in Anthropology, Franklin and Marshall College, Lancaster, PA; MS in Forestry, Michigan Technological University, Houghton, MI; 3 years of experience in community development and 2 years in planning.
Fred Levitan	Hydrologist	BS in Geology, Stanford University, Stanford, CA; MS candidate in Environmental Systems, Humboldt State University, Arcata, CA; 15 years of experience.
Bob Lowdermilk	Logging Systems / Transportation Planner	BS in Business Management, Western Carolina University, Cullowhee, NC; 34 years of experience in timber sale planning, preparation, and administration.

Name	Title	Education / Responsibility / Experience
Mike Mateyka	Silviculture and Economics	BS Forestry Management, University of Wisconsin; 30 years of Forest Service experience; emphasis in vegetation management, silviculture, and planning.
Linda Morehouse-Braxton	Assistant Resource Officer	Various resources – 26 years of Forest Service experience in recreations/lands/minerals management, timber sale preparation/administration, and business administration.
Cindy Roberts	District Wildlife Biologist	MS in Wildlife Management; BS in Wildlife Biology, Sacramento State University, Sacramento, CA; 16 years of experience in wildlife management.
Daniel Roskopf	Forester, Silviculturist	BS Forest Resource Management, Minor Natural Resources, Humboldt State University, 1984; Silviculture Institute, Oregon State University, and University of Washington, 1992; California Certified Pesticide Applicator; 22 years of experience in fire, timber, and silviculture.
Deborah Tibbetts	Assistant District Archaeologist	BA in Anthropology, University of California Berkeley; MA In Anthropology, California State University, Chico; 15 years of experience in archaeology.
Kelly Whitsett	District Hydrologist	MS in Hydrogeology, University of Arkansas–Fayetteville; BS is Geology and Geophysics, University of Missouri–Rolla; 3 years of experience in forest hydrology.
Katherine Worn	District Planner	MS in Interdisciplinary Natural Resources and BS in Forestry, Humboldt State University, Arcata, CA; 20 years of experience in natural resource management.

4.1.2 Federal, State, and Local Agencies

The Forest Service consulted with the following federal and state agencies during the development of this environmental impact statement.

4.1.2.1 United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) species list for the Plumas National Forest was issued on April 23, 2003 (USFWS reference 1-1-03-SP-1810), and updated by computer database on August 30, 2005. This list fulfills the requirement to provide a current species list pursuant to Section 7(c) of the *Endangered Species Act*, as amended.

Wildlife. The formal consultation between the Forest Service and USFWS began on May 4, 2004. At that time, the Threatened, Endangered, Proposed, Sensitive, and Candidate species with the potential to occur in the Slapjack Project area were reviewed. Communications between the Forest Service and USFWS have been ongoing since initial contact with the USFWS.

Beginning in May 2004, a series of informal meetings and written correspondence have occurred between the Forest Service and USFWS regarding the federally listed California red-legged frog and bald eagle found in the project area. It has been determined through informal consultation that the

proposed treatments for the Slapjack Project would not adversely affect the California red-legged frog and would not affect the bald eagle, if Forest guidelines were followed for protection of these species. The *Federal Register* notice released on November 3, 2005, advised that the California red-legged frog be managed under *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act), as amended by the Sierra Nevada Forest Plan and administered by the Plumas National Forest.

The draft study plan for the Plumas and Lassen National Forests Administrative Study (now referred to as Plumas Lassen Case Study), dated September 12, 2001, was reviewed by the USFWS, as was the proposed action for the Administrative Study dated December 10, 2002. In response to the initial proposed action, a USFWS letter dated January 31, 2003, expressed concern over specific road construction proposed for access to group selection harvest units and the road's effect on fragmentation to old forest dependent species.

Rare Plants. On January 17, 2006, the Forest Service initiated formal consultation with the USFWS on the Threatened plant *Senecio layneae*. The USFWS was contacted in the spring of 2005 regarding the potential occurrence of *Senecio layneae* in the project area. Kathy Brown of the USFWS attended a field meeting in the project area on August 3, 2005. The *Senecio layneae* site was visited, and potential treatments were discussed. She was supportive of treatments consistent with those listed in the USFWS *Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills* (USFWS 2002), which includes desired future conditions for *S. layneae*. On September 26, 2005, Kyle E. Merriam (Associate Sierra Cascade Province Ecologist) sent an email to Kathy Brown requesting clarification on permitting. According to Ms. Brown, Section 7 of the *Endangered Species Act* provides for monitoring, and a permit would not be required.

4.1.2.2 California Department of Fish and Game

The department was contacted during scoping for the Slapjack Project and was provided with the proposed action. The department manages wildlife populations for the state of California, and their emphasis with the Forest Service is typically on game species such as the local deer herds and associated habitats.

4.1.3 Tribes

The following federally recognized tribes and interested and affected tribes were consulted regarding the Slapjack Project: Mooretown Rancheria, Enterprise Rancheria, Berry Creek Rancheria, Chico Band of Mechoopda Indians, and the Konkow Valley Band of Maidu. No concerns were raised during consultation.

4.1.4 Organizations

In 2003 the Forest Service began collaboration with a group of organizations interested in reducing wildland fire risk to communities and the environment in Butte and Yuba Counties. The Forest Service met regularly with a core group comprised of representatives from the Natural Resource Conservation Service, California Fire Safe Council, Butte Fire Safe Council, Yuba Watershed Protection and Fire Safe Council, the Quincy Library Group, Rancherias, industrial timberland owners including Soper-Wheeler and Chy Company, and other private landowners. Other

groups or organizations involved include the Bureau of Land Management and the California Department of Forestry and Fire Protection. The Slapjack Project developed from this collaborative effort. In September 2004, the Forest Service helped organize the Eastern Butte/Yuba Fire Prevention Planning Tour, sponsored by the Butte Fire Safe Council and Yuba Watershed Protection and Fire Safe Council. The goal of the tour was to educate and promote a collaborative and coordinated planning process to address fuel reduction and fire prevention on a landscape scale.

Collaboration with the Butte Fire Safe Council and Yuba Watershed Protection and Fire Safe Council has been ongoing since 2003. Forest Service personnel have been in regular attendance at monthly Fire Safe Council meetings and have kept the councils and other stakeholders apprised of changes in project status. In September 2005, the Forest Service formally presented the Slapjack Project to the Butte and Yuba Fire Safe Councils. Both councils responded with letters of support.

4.2 Distribution of the Draft Environmental Impact Statement

The draft environmental impact statement was distributed to agencies, organizations, and individuals as required by the Council on Environmental Quality regulations (40 CFR 1502.19) that implement the *National Environmental Policy Act*. In addition, copies have been sent to the following federal agencies; federally recognized tribes and interested and affected tribes; state and local governments; and organizations. The complete mailing list is on file at the Feather River Ranger District Office.

4.2.1 Federal, State, and Local Agencies

Council on Historic Preservation

Director for Planning and Review Advisory, Washington DC

Environmental Protection Agency

Region 9 Federal Activities Office, Laura Fujii, San Francisco, CA

EIS Filing Section, Washington DC

Federal Aviation Administration, Western-Pacific Region, Lawndale, CA

Federal Highway Administration

California HDA-CA, Sacramento, CA

National Marine Fisheries Service, Longbeach, CA

US Department of Homeland Security

U.S. Coast Guard, Washington DC

US Department of Agriculture

Natural Resources Conservation Service, Washington DC

APHIS PPD/EAD, Riverdale, MD

National Agricultural Library, Beltsville, Maryland

Forest Service, Ecosystem Management Coordination, Washington DC

US Department of Defense

Army Engineer Division, CESPD-CMP, San Francisco, CA

US Department of Energy

Office of NEPA Policy & Compliance, Washington DC

US Department of the Interior

Fish and Wildlife Service, Wayne S. White, Sacramento, CA

Director, Office of Environmental Policy & Compliance, Washington DC

4.2.2 Tribes, Organizations, and Individuals

A summary of the *Slapjack Project Draft Environmental Impact Statement* was sent to the following organizations, individuals, and federally recognized tribes and interested and affected tribes:

Tribes	Berry Creek Rancheria
	Enterprise Rancheria
	Mooretown Rancheria
	Chico Band of Mechoopda Indians
	Konkow Valley Band of Maidu
Organizations and Individuals	Michael Glaze, South Feather Water & Power
	Kenneth J. Wilde, Sierra Pacific Industries – Lincoln
	Pat Gallagher, Sierra Club
	Greg Cromptom, Dobbins / Oregon House Action Committee
	Jim Brobeck, Lassen Forest Preservation Group
	Craig Thomas, Sierra Nevada Forest Protection Campaign

Richard Dahms Lake Francis Grange #745

Vivian Parker, California Indian Basketweavers Association

Lana Fredericks.

James V. Stevens, C.E. Stevens Properties, LLC

John Middlebrook

Leslie & Bruce Steidl

Max H. Doner, Doner Tree Farms, L.L.C.

Richard Frey, Siller Brothers, Inc.

Pete Harrison, Californians for Alternatives to Toxics

Frank Stewart, Counties' QLG Forester

Jeanette Brown, Yuba County Resource Conservation District

James P. Johnson, Applied Forest Management

Michael Glaze, South Feather Water & Power

G. Keith Chambers, The Chy Company

Pete Hammontre, Dobbins/Oregon House Fire Protection District

Jennifer Kalt, California Native Plant Society

Laura R. Olson

Jerry Vander Beek

Bill Wickman, American Forest Resource Council

John Prechutti, Plumas Forest Project

Scott Lawson, Plumas County Museum

Glenn Nader, Yuba Watershed and Fire Protection District

Vivien Richards

Erik Ryberg, Center for Biological Diversity

Ted Bake

Dale Meese, CDF Forester

Sam Callison

Margaret Whitt

Chad Hanson, John Muir Project

Central Valley Water Quality Board

Acronyms

BA	biological assessment
BACM	Best Available Control Measure
BE	biological evaluation
BMP	Best Management Practices
CAS	Chemical Abstract Service
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWHR	California wildlife habitat relationships
dbh	diameter at breast height
DFCN	draft forest carnivore network
DFPZ	Defensible Fuel Profile Zone
EHR	Erosion Hazard Rating
EIS	environmental impact statement
ERA	Equivalent Roaded Area
FMA	Fire Management Analyst
FOFEM	First Order Fire Effects Model
FSH	Forest Service Handbook
HFQLG	Herger-Feinstein Quincy Library Group
ID	interdisciplinary
LD	lethal dose
LC_{50}	lethal concentration
LD_{50}	lethal dose
LRMP	land and resource management plan
LSOG	late-successional old-growth

MIS	Management Indicator Species
mmbf	million board feet
MMM	Management and Mitigation Measures
NEPA	National Environmental Protection Act
NFFL	Northern Forests Fire Laboratory
NFMA	National Forest Management Act
NOAEL	No Observable Adverse Effects Level
NOEC	No Observable Effect Concentration
NOEL	No Observable Effects Level
NRHP	National Register of Historic Places
NTMB	Neotropical migratory birds
NTU	nephelometric turbidity units
OHV	off-highway vehicle
PAC	Protected Activity Center
PM	particulate matter
PSW	Pacific Southwest Research Station
RAWS	Remote Automated Weather Station
RCA	Riparian Conservation Area (under SNFPA)
RFCC	fire regime and condition class
RHCA	Riparian Habitat Conservation Area (under HFQLG)
RCO	Riparian Conservation Objective
RMO	Riparian Management Objective
ROS	Recreational Opportunity Spectrum
SAT	Scientific Analysis Team
SMC	Sierra mixed conifer

SMZ	Stream Management Zone
SNFPA	Sierra Nevada Forest Plan Amendment
SOHA	Spotted Owl Habitat Area
TMDL	Total Maximum Daily Load
TOC	Threshold of Concern
USDA	United States Department of Agriculture
VQO	Visual Quality Objective

Glossary

Acid equivalent — when making herbicide rate recommendations for herbicides that are available as either salts or esters or both, it is a common practice to make the recommendations on the basis of pounds of the acid equivalent of the active ingredient per acre (lb ae /A). The acid equivalent of a salt or ester form of a herbicide is that portion of the molecule that represents the parent acid (herbicidal portion) form of the molecule (Wood et al. 1996).

active crown fire — the independent movement of flames from a fire through the branches and top of the trees.

age class — a distinct aggregation of trees originating from a single natural event or regeneration activity.

all-aged — see uneven-aged.

allelopathic — the suppression of growth of one plant species by another due to the release of toxic substances.

bald eagle habitat —

primary bald eagle habitat - land within a 0.25 mile radius of a nest tree.

secondary bald eagle habitat - land adjacent to the primary habitat that is used predominantly for roosting and perching and also to a lesser degree for foraging.

tertiary bald eagle habitat – areas used by eagles for foraging.

basal area — the combined area of the cross sections of tree boles at a height of 4.5 feet above the ground, generally given as square feet per acre.

biomass — limbs and foliage (parts of trees other than logs) that can be collected, chipped, or ground; exported from the forest; and used for power production or manufacture of wood fiber products.

bole — the main stem of a conifer tree, which becomes a log or logs when the tree is cut.

California Wildlife Habitat Relationships (CWHR) — a system developed jointly by Forest Service Region 5 and the California Department of Fish and Game that classifies forest stands by dominant species types, tree sizes, and tree densities and rates the resulting classes in regard to habitat value for various wildlife species or guilds. The CWHR system has three elements: (1) major tree-dominated vegetation associations, (2) tree size, and (3) canopy cover. Tree size and canopy cover classes are:

Tree Size Classes

1 = Seedling (less than 1 inch dbh)
2 = Sapling (1–6 inches dbh)
3 = Pole (6–11 inches dbh)
4 = Small (11–24 inches dbh)
5 = Medium/Large (greater than 24 inches dbh)
6 = Multilayered (size class 5 over a distinct layer of size class 3 or 4, total canopy greater than 60-percent closure). In this EIS, class 6 is included in class 5.

Canopy Cover Classes

S = Sparse Cover (10–24 percent canopy closure)
P = Poor Cover (25–39 percent canopy closure)
M = Moderate Cover (40–59 percent canopy closure)
D = Dense Cover (greater than 60 percent canopy cover)

canopy — the branches and foliage of trees (as distinct from the stem or bole).

Canopy base height — the height above the ground of the first canopy layer where the density of the crown mass within the layer is high enough to support vertical movement of a fire.

canopy cover — the ground area covered by tree crowns, or the degree to which the canopy blocks sunlight or obscures the sky, expressed as a percent of ground area. Also referred to as canopy closure or crown cover.

chain — A chain is a measurement of distance. One chain = 66 feet.

closed road — a road from which mechanical equipment is excluded. A Forest Service road in closed status is a road that is still part of the Forest Service road system but has been closed to traffic by some type of barrier, such as a gate, berm, or boulder(s).

crown — see canopy.

crown base height — for a single tree, it is the height from an imaginary line drawn across the trunk to the bottom of the obvious lowest live foliage.

crown bulk density — canopy weight per unit volume.

crown cover — see canopy cover.

decommission — closing a road to mechanical use and returning the road to a natural or semi-natural condition. This could include removing stream crossing fills and structures (e.g., culverts or bridges), recontouring to natural topography obliteration (e.g., replacing fill slope material against cut slopes), surface shaping (e.g., constructing in-road water bars), and/or surface scarification.

Defensible Fuel Profile Zone — a zone approximately 0.25 mile wide accessible to firefighters (usually along roads) in which fuel loads are light enough to cause approaching crown fires to drop to the ground where it may successfully be attacked by ground forces during 90th percentile weather conditions.

diameter at breast height — the diameter of a tree measured at 4.5 feet above the ground on the uphill side.

direct economic impact — effects caused directly by forest harvest or processing or by forest uses.

disturbance — a natural event such as a fire, flood, or earthquake.

dripline — the perimeter of the vertical projection of a tree canopy upon the ground.

duff / duff layer — Decaying leaves and branches on the forest floor.

effective ground cover — is the amount of ground cover left after the fire; it is expressed in percent.

endemic — in the context of this environmental impact statement, refers to localized pockets within a small area, such as a pocket within a stand or a small stand.

Equivalent Roaded Area — a conceptual unit of measure used to assess ground-disturbing activities. All landscape disturbances are evaluated in comparison to a completely impervious or roaded surface. Road surfaces are considered to represent 100 percent hydrologic disturbance, with maximum rainfall-runoff potential. Other ground-disturbing activities are assigned disturbance coefficients that represent a typical ratio of their hydrologic impact compared to the same roaded area. Disturbance coefficients are assigned based on local conditions. In a given watershed, disturbances are added together to determine a cumulative equivalent roaded area and compared to the Threshold of Concern.

fire brand — burning material, such as foliage, that is carried by the wind to start new fires outside the main fire (spotting).

fire frequency — the average number of years between fires.

fire regime and condition class — a classification of the amount of departure from the natural fire regime. Assessing fire regime and condition class can help guide management objectives and set priorities for treatments.

fire type — a description of how a fire burns, such as on the forest floor (surface) or in the tree crowns.

flame length — the length of flame measured in feet. Increased flame lengths increase resistance to control and likelihood of torching events and crown fires.

fuel arrangement — how fuels are distributed in the fuel bed.

fuel bed — The fuels both living and dead that are available to burn.

fuel loading — the weight of fuel (vegetative matter both living and dead) present at a given site; usually expressed in tons per acre. This value generally refers to the fuel that would be available for consumption by fire.

fuel strata — this is the vertical and horizontal continuity and arrangement of the fuel bed.

grapple pile — gathering and piling of thinnings, harvest slash, and brush using mechanical equipment.

group selection — a silvicultural system that involves harvest of small areas of trees (generally less than 2 acres). Implementation results in uneven-aged (all-aged) forests consisting of small even-aged (same-aged) groups. Harvest openings must be large enough to allow for sufficient sunlight for regeneration tree seedlings to establish and grow.

grubbing — removal of vegetation at or below ground level with hand tools.

guild — used to group plant species that use similar resources in a similar way. Plant species in the same guild are found in similar habitat types and have similar environmental requirements.

hand piling — piling branches and limbs from tree harvests or thinnings by hand for burning at a later time.

hand line — fire lines created by forest workers using shovels and hand tools to remove organic materials and expose mineral soil. The line width generally ranges between 2 and 3 feet.

hazard quotient — the ratio of the estimated level of exposure to the reference dose or some other index of acceptable exposure.

Home Range Core Area — mapped foraging area.

horizontal arrangement — the horizontal distribution of fuels at various levels and planes.

indirect economic impact — an effect that occurs when supporting industries sell goods or services to directly affected industries.

individual tree selection — a type of tree harvest designed to prevent the spread of insects and disease, reduce overstocking, and generally improve or maintain health of forest stands.

induced economic impact — an effect that occur when employees or owners of directly or indirectly affected industries spend their income within the economy.

Interdisciplinary Team (ID Team) — The team of Forest Service resource specialists involved in project planning and analysis. The ID Team members for the Slapjack Project are listed in at the beginning of this chapter.

ladder (fuel) — shrubs or trees that connect fuels at the forest floor to the tree crowns

landings — forested openings that are cleared of vegetation, leveled, and graded and used to store (deck) logs and eventually to load log trucks for haul to the mill.

late-successional old-growth ranks 4 and 5 — late mature successional stages of forest trees, as defined by the Sierra Nevada Ecosystem Project (volume II, appendix 21.1).

leave trees — the trees that are purposefully left in a stand that is thinned or harvested.

LC_{50} (lethal concentration) — a calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50 percent of a defined experimental animal population.

LD_{50} (lethal dose) — the dose of a chemical calculated to cause death in 50 percent of a defined experimental animal population over an observation period, typically 14 days.

lotic — of, relating to, or living in actively moving water.

mast — the fruit of the oak and other forest trees used as food by wildlife.

mastication — mechanical grinding of harvest residue or thinnings; masticated material is usually left scattered on the harvest site.

matrix — the untreated area between group selections within a stand or treatment unit.

mechanical thinning — the use of tractors, cable systems, or helicopters to remove trees that have been cut by chainsaws; also refers to the use of feller-bunchers—wheeled vehicles with lopping shears or saws that cut and collect trees and carry them to a landing site.

midden — refuse heap, dunghill, a small pile of seeds, bones, or leaves gathered by a rodent.

multilayer — stand with three or more distinct foliage layers (canopies). Trees in the different layers may or may not be in the same age class.

mycorrhiza — the mutually beneficial association of a fungus and the roots of a plant, such as a conifer or an orchid, in which the plant's mineral absorption is enhanced and the fungus obtains nutrients.

natural fire regime — a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but it also includes the influence of aboriginal burning (Agree 1993; Brown 1995).

No Observed Adverse Effect Level (NOEL) — the dose of a chemical at which no statistically or biologically significant increases in frequency of severity of adverse effects were observed between the exposed population and its appropriate control. Effects may be produced at this dose, but they are not considered to be adverse.

No Observed Effect Concentration (NOEC) — the highest concentration or amount of chemical in the test system that causes no observable biological effect to the target organism.

No Observed Effect Level (NOEL) — the exposure level at which there is no statistically or biologically significant differences in the frequency or severity of any effect between the exposed or control population.

90th percentile weather conditions — hot, dry, and windy weather conditions that are exceeded only 10 percent of the time during fire season; 90th to 97th percentile conditions are considered *high*; 99th to 100th percentile are considered *extreme*.

Off Base and Deferred Lands — federal lands identified in the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act from which timber harvest and road construction are excluded during the term of the HFQLG Pilot Project.

operability — the ability to conduct vegetation management operations, which include construction of access roads and log landings, use of cable logging systems, clearing of central skid trails for tractor logging, and removal of trees that pose hazards to forest workers.

particulate matter — the general term used for a mixture of solid particles and liquid droplets found in the air. Some particles are large enough to be seen as dust or dirt. Others are so small they can be detected only with an electron microscope. $PM_{2.5}$ describes the "fine" particles that are less than or equal to 2.5 µm in diameter. "Coarse fraction" particles are greater than 2.5 µm, but less than or equal to 10 µm in diameter.

passive crown fire — the movement of fire through groups of trees; it usually does not continue for long periods of time.

phylogenetic — the development of a species, genus, or group as contrasted with the development of an individual.

piling and burning — piling harvest or thinning residues (branches and limbs) and burning them when moisture content has been reduced through evaporation, wildfire hazard is low, and atmospheric conditions are favorable for dispersal of smoke.

prescribed burning — fire purposefully ignited to achieve a beneficial purpose, such as reducing fuels on the forest floor or fuels generated by logging or thinning forest trees.

present net value — includes only the benefits and costs of producing primary outputs, excluding secondary benefits.

primary skid trails — skid trails over which equipment has skidded or will skid logs three or more times.

production rates — the amount of fireline distance expressed in chains that a suppression resource can establish in a given time period.

quadratic mean diameter — the upper story diameter of a tree of mean basal area within dominant or codominant positions in the stand. In other words, instead of being an arithmetic average of tree diameters, it is a weighted average based on the basal area of each tree in the upper story within the stand.

rate of spread — the relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire. For this document it is expressed as rate of forward spread of the fire front and is measured in chains per hour.

reconstruction — rebuilding of an existing road in or adjacent to its current location to improve capacity and/or correct drainage problems.

regeneration — tree seedlings and saplings that have the potential to develop into mature forest trees.

release — in the context of this environmental impact statement, giving large, old pines more space to grow—to "release" them from crowded conditions.

residual trees — trees that are left to grow in a stand following treatment or fire.

resistance to control — the relative difficulty of constructing and holding a control line as affected by resistance to line construction and fire behavior; also called "difficulty of control."

RfD, reference dose — a daily dose which is not anticipated to cause any adverse effects in a human population over a lifetime of exposure. These values are derived by the U.S. Environmental Protection Agency.

Riparian Habitat Conservation Areas — zones of specified widths along streams and watercourses and around lakes and wetlands that vary according to stream or feature type, as described in the Scientific Analysis Team guidelines.

sanitation — tree removal or modification operations designed to reduce damage caused by forest pests and to prevent their spread.

scorch-to-kill height — the maximum vertical height at which lethal scorching of foliage occurs. Below this height, all foliage is brown and dead; above it, live and green.

serpentine substrate — a dull green or brownish mineral consisting of hydrous magnesium silicate. It is often used as an ornamental stone.

seral — relating to a series of ecological communities formed in ecological succession.

shade intolerant — species (such as ponderosa pine) that require full, open sunlight on the forest floor to establish and grow.

silviculture — a branch of forestry dealing with the development and care of forests.

size class — a classification of forest stands based on the average diameter of trees in the stand.

snag — a dead standing tree.

stocking level — the number of regenerated trees per acre in a tree-harvest unit.

subsoiling — performed after vegetation treatments, wherein mechanized equipment is used to till compacted soil to reduce soil compaction and consequent soil erosion.

surface fire — a fire that burns surface litter, debris, and small vegetation.

thinning from below — the process of thinning a conifer stand by removing the smallest diameter trees and successively removing larger diameter trees until a canopy cover or basal area retention standard is met for the stand.

Threshold of Concern — describes the amount of disturbance when detrimental responses may begin to occur. Estimates of watershed "tolerance" to land use may be established based on basin-

specific experience, comparison with similar basins, and modeling of watershed response. These indices of allowable levels of disturbance are called Thresholds of Concern. The tolerance of a watershed is used to prescribe mitigation measures to prevent detrimental responses. The Threshold of Concern does not represent an exact level of disturbance above which cumulative watershed effects will occur. Rather, it serves as a “yellow flag” indicator of increased risk of significant adverse cumulative effects occurring within a watershed. It is compared to the equivalent roaded area score, and its units of measure are expressed as percent disturbed and percent of Threshold of Concern.

torching — (1) the envelopment in flame of live or dead branches on a standing tree or group of trees; (2) fire burning a single or very small group of trees.

tree mortality —is the probability that a live tree will die expressed in percent.

ultramafic — extremely basic; very low in silica and rich in iron and magnesium minerals.

underburning — a prescribed fire in fuels on the forest floor that is intended to generally remain on the forest floor without consuming significant portions of the forest canopy.

uneven-aged — a stand of trees of three or more distinct age classes, either inter-mixed or in small groups. Uneven-aged silvicultural systems are a planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes.

vertical arrangement — is the arrangement of a fuels above the ground in their relationship to one another.

whole tree removal — the whole-tree harvest method is where trees are felled at the stump and skidded to the landing for de-limbing, bucking, and processing. Large trees may be bucked in the treatment unit to facilitate removal to the landing and reduce skidding damage to residual trees. Most activity slash would be removed to the landing.

Wildland Urban Interface (WUI) —The area, or zone, where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. It generally extends out for 1.5 miles from the edge of developed private land into the wildland.

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